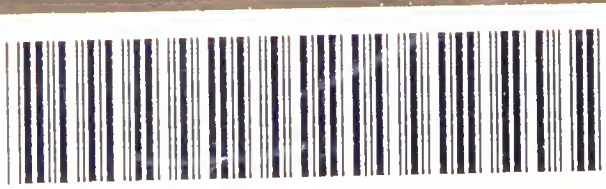
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THERAPEUTICS

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A GUIDE

TO

THERAPEUTICS

BY

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FOURTH EDITION

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PREFACE

TO

THE FOURTH EDITION.

The preparation of this Edition has been made more laborious than usual by the recent appearance of the British Pharmacopœia of 1885, and the very extensive alterations and additions which it contains. It would have been impossible for me to have made adequate reference to these had it not been for the kindness of Dr. Quain, who gave me the opportunity, of which I have freely availed myself, of working through an early copy of the new edition. The principal changes made have been in the direction of leaving out certain substances which have become obsolete, and of adding a large number of others which have obtained a firm hold on professional confidence.

The omissions are seventeen in number, and consist of areca nut, iodide of cadmium and its ointment, castor and its tincture, elm bark and its decoction, digitalin, dulcamara and its infusion, iodide of iron (solid), magnetic oxide and moist peroxide of iron, green iodide of mercury, tobacco enema, solution of atropia, gentian mixture, quinine pill, buckthorn juice and its syrup, acetate of soda, and stramonium leaves. I would gladly have seen this list much extended, and made to include a large number of utterly useless articles which still linger on in our text-books, and whose reputation depends on

a mysterious and unscientific catalogue of supposed virtues handed down from one generation of authorities to another. I should like to have seen a clean sweep made of these, and must express some disappointment that official sanction has not been given to lightening the pages of our manuals of materia medica and the memory of the over-taxed student of many drugs which no one ever dreams of prescribing, and which in some instances probably could not be found if they were wanted. But if the pruning-knife has been used with unnecessary caution, the list of additions is an admirable one, and, containing, as it does, 113 primary articles and their preparations, it includes all the recently introduced drugs which seem to stand on a firm basis, and which have already proved useful in practice. Some other alterations have been made, one of which is an attempt to standardise the strength of the preparations of certain active drugs, and another to make the names of the alkaloids terminate in *-ine*.

In conclusion, I have to thank my friend Mr. Carteighe, President of the Pharmaceutical Society, for many valuable practical suggestions, and to acknowledge the great benefit I have derived from a study of the important works recently published by Drs. Lauder Brunton (a text-book of Pharmacology, Therapeutics, and Materia Medica) and Mitchell Bruce (Materia Medica and Therapeutics).

PREFACE

TO

THE FIRST EDITION.

In these days of profuse publication, a Preface coming from any one who ventures to write a text-book must assume, in great measure, an apologetic tone. Elaborate and comprehensive works on Therapeutics now crowd our shelves, and the question may not unnaturally arise, What excuse can be given for adding another item to the rapidly increasing list? In reply to this I can only express a hope that room may be found for a smaller handbook than those more elaborate treatises which reflect so faithfully the progress of modern science, and that my little bark may float peacefully by the side of more richly laden vessels without being entirely submerged by their waves. I cannot, of course, expect either to supersede or to rival the classical manuals of Ringer, Wood, and others, and all I aim at is to present the subject in briefer compass, in perhaps more systematic form, and unencumbered by any botanical or pharmaceutical detail.

Space has not enabled me to acknowledge the sources from which I have been enabled to compile the following pages; and I can only express in general terms my grateful sense of

the labours of many able and industrious workers in the field of Therapeutics. I have freely drawn much valuable material from the systematic works of Stillé, Neligan, Garrod, Ringer, Wood, Bartholow, Phillips, Thorowgood, Nothnagel, Royle, and Christison; and I have also derived important instruction from the writings of Brunton, Handfield Jones, Fraser, Fothergill, John Harley, Anstie, Broadbent, Liebreich, and many others, who have contributed important aid to the progress of our subject in later years.

For many of my prescriptions I am more especially indebted to Bartholow, and to the very handy little 'Lessons on Prescribing,' by Dr. Hansell Griffiths.

23 Brook Street, Grosvenor Square, W.
April 1877.

PREFACE

TO

THE SECOND EDITION.

In preparing a Second Edition of my little book, I have subjected it to a thorough revision, and have endeavoured as far as possible to bring it up to a level with the most recent knowledge. I have to thank my friendly critics of the press for many valuable suggestions, and my gratitude is more especially due to Dr. Frank Woodbury, of Philadelphia, who in the two American editions, which he has so ably supervised, has added many valuable facts and suggestions, of which I have not been slow to avail myself.

PREFACE

TO

THE THIRD EDITION.

The period which has elapsed since the appearance of my Second Edition has not been characterised by much activity in the field of Therapeutic research, and I have not therefore been able to impart to this my Third Edition anything of very special novelty. But I have endeavoured to keep thoroughly abreast with scientific progress, and hope that practitioners and students may find in these pages some reference, at least, to everything which they can be expected to know about the action of drugs.

THERAPEUTICS.

Previous to the study of the individual articles comprised within our national Pharmacopœia, the temptation is very strong to launch into a disquisition on the general principles of therapeutics. So many interesting physiological considerations are involved in the actions and uses of drugs, and so many important illustrations might readily be drawn from the wide field of practical medicine, that little apology would really be needed for consuming some of our space in this way. Therapeutics have lately shown a systematic vitality which amply redeems their credit from the old-fashioned accusation of want of progress, and perhaps in no other department of our profession have more solid and satisfactory advances been made. But this very condition of vigour renders far more laborious and responsible the task of attempting to reduce to anything like precision the laws on which we are henceforth to prescribe our drugs, or to draw complete generalisations from the enormous mass of complicated material now at our disposal. Progress may occasionally cause temporary confusion by disturbing old beliefs, and furnishing vast legions of sometimes unconfirmed and possibly ill-digested facts; and our present subject is by no means exempt from this almost inevitable tendency of true science.

A careful study of the many exhaustive works on therapeutics published within the last twenty years brings before us a strange medley of experimental evidence, confusing and

contradictory it may be at times, but giving most encouraging proofs of the large amount of honest and persevering work now being devoted to the elucidation of this the most important department of the materia medica. In the following pages we must necessarily assume a dogmatic attitude, and if the extreme precision with which our plan compels us to lay down the actions of drugs offends many whose faith is undeveloped or wavering, we can only excuse ourselves by a conscientious desire to contribute something towards a more scientific scheme of arrangement. Although the time has not yet fully come for a complete explanation of all the therapeutical effects of medicinal agents by their proved physiological properties, I have ventured to take a step in this direction, and must only hope that my very defects and failures may be of use in helping others to develop my principles with greater success.

THE ROUTES BY WHICH MEDICINES ENTER THE CIRCULATION.

1. External Method of Application.

By this I do not mean the merely local action of irritants, caustics, or sedatives, but the attempts which we make to utilise the absorptive function of the cutaneous surface for therapeutic purposes. Now, the *skin* would, at first sight, seem to be a very convenient and tempting arrangement for passing our medicines directly into the blood; but unfortunately for this purpose, the vascular *cutis vera* is protected by the horny epidermis, which interposes a very considerable barrier to absorption. Much discussion has arisen on this point, and it now seems pretty certain that most drugs cannot permeate the epidermis readily, if at all, in watery solution, and hence this—(*a*) the *epidermic*, as it has been styled, or the method by *inunction*—is not of very wide application, save in the administration of mercury, and sometimes bella-

donna and digitalis. Fats and oils, and probably glycerine, increase our chances of procuring absorption in this way, and alcohol may be of service by dissolving the sebaceous secretion of the skin.

It has been most confidently asserted that solution of the alkaloids in chloroform will enable them readily to make their way through the cuticle, the chloroform freely penetrating this structure by diffusion, carrying with it the dissolved substances; but some careful experiments with atropine have convinced me that the merits of this combination have been greatly exaggerated. Immersion of a finger for an hour in a solution of atropia in chloroform (gr. j. ad ʒj.) produced not the slightest dryness of the throat, nor any physiological symptoms.

The cuticle, then, being our chief obstacle, it would seem an easy matter to overcome the resistance by its removal, and indeed this, (*b*) the *endermic plan*, as it is called, has done some good service in therapeutics. Having procured a raw surface by a blister, we may apply morphine, strychnine, or any drug we may wish to use, directly to the *cutis vera*, and thus obtain an undeniably active effect in chronic rheumatism, neuralgia, and other painful affections. But the process is slow and painful, it may be disfiguring, and cannot be very frequently repeated, and it has therefore been, justly, almost entirely superseded by the (*c*) *hypodermic* plan. This, being a rapid, economical, and most efficient proceeding, has come into very general use, the principal drawback being that the pleasant soothing influence and relief from pain which morphine thus gives our patients has introduced a form of opium-habit, perhaps hardly less obstinately adhered to than the old-fashioned form. Unfortunately, however, not all drugs, nor even all alkaloids, are available for this method of administration, as two conditions are requisite for success—the fluid to be injected must be small in bulk, and must be unirritating to the tissues. Chloral has been thus used, but without much success; quinine, though efficient, is unhappily

irritating; ergotine produces hard, discoloured, and painful lumps; mercury usually causes abscess; and practically we are almost restricted to morphia, atropia, and strychnia, and of these the first-named is by far the most available. We may refer to a description of the way in which the little operation is performed, under the subject OPIUM, remembering always that drugs act three or four times more powerfully when given by hypodermic injection than by the mouth.

Some authorities advise us to carry these injections boldly into the substance of the muscles, and it is said that strychnia thus acts well in some forms of paralysis, but of this I have no personal experience. The parenchymatous method, as this is called, finds special favour abroad, and we are told that from five to twenty minims of chloroform thus introduced deeply into the thigh is a certain cure for sciatica. I have only tried this method of treatment in one case, but the excruciating pain following the operation, and the trifling and temporary benefit it produced, have convinced me that the remedy may be even worse than the disease.

Then, again, injections may be made directly into the veins, and this would, theoretically, seem to be the best, because the most straightforward of all methods. We must not forget, however, that many drugs require to be acted on by some of the digestive juices before their full therapeutic powers are developed, and that the dangers of phlebitis, thrombosis, and of the admission of air into the veins, with all their perilous consequences, cannot be overlooked. (*d*) *Intravenous injection* is therefore reserved for very desperate cases, and the most notable illustration is in the operation of transfusion, by which, after severe hæmorrhage, lives have undoubtedly been saved. The intravenous injection of chloral, so much praised abroad, has, so far as I know, been hardly practised at home.

2. Internal Administration.

1. Inhalation must stand first, on account of the great facility of its application, of its remarkable efficiency, and of the great purity, so to speak, with which drugs thus enter the blood. Anæsthesia produced by chloroform, ether, or laughing-gas will occur, as the leading example, to every mind, and we know that the British Pharmacopœia has acknowledged the principle by the admission of six vapours—acidi hydrocyanici, chlori, coninæ, creasoti, iodi, and olei pini sylvestris. But little use, however, has yet been made of this tempting channel for the administration of agents intended to act on the system generally, perhaps partly because it is a matter of doubt as to how far the delicate structures of the air-cells might be tolerant of the prolonged or repeated contact with possibly irritating substances. At present, inhalation has been almost confined to the treatment of lung diseases, and ipecacuanha, arsenic, stramonium, tannin, and carbolic acid have been thus employed; but there is no doubt that this plan is capable of much wider development, and that the Germans are far ahead of us in this respect. It is evident, however, that a barrier must always exist to the very extended adoption of aërial medication, by the irritant nature of some medicines, and the impossibility of reducing others to that minute subdivision which is essential either for ordinary inhalation or the formation of a readily absorbable spray.

2. Medicinal agents may be injected into any of the open cavities of the body. The rectum is much used in this way, and enemata, clysters or injections as they are called, may be divided into three classes.

a. Purgative Enemata.—For efficient and easy evacuation of the large bowel, no method can compare to this. They may be composed of water alone, of salt and water, of gruel, or oil, or of any of the purgative enemata contained in the Pharmacopœia (Br.), their bulk varying from 12 ounces to a

pint, and their function being not only to act mechanically by washing out the contents of the bowel, but to stimulate its peristaltic movements, which they do very efficiently.

b. Those enemata which are intended for absorption, and which must, therefore, be small in quantity (ʒj.–ij.), so as not to excite the expulsive movements of the gut. The principal of these is the enema opii, so highly prized on account of its restraining influence on the diarrhœa of typhoid and phthisis, and on account of the happy way in which it soothes pain, not only in the rectum, but, by nervous sympathy, also in the neighbouring bladder and uterus. Astringents are also occasionally used in this way, whilst assafœtida, ipecacuanha, &c., find their special applications, which will be considered elsewhere, although we may here lay down the general rule that drugs, with one exception (strychnia), act about half less powerfully by the rectum than by the stomach.

Another mode of utilising the absorptive power of the bowel is by suppositories, or pastille-shaped masses of medicated oil of theobroma, wax, and lard, which are readily introduced within the sphincter ani, where they rapidly melt at the temperature of the body.

c. Nutrient enemata are of great service in cases where swallowing is prevented by cancer or stricture of the œsophagus, or where we wish to give the stomach, irritated by the presence of chronic ulcer, a thorough rest. The great difficulty, of course, is that the rectum, although it absorbs readily, has no digestive function, so that we must either compose our enema of very simple materials, or else add pepsin and acid or pancreatic fluid.

3. We now come to the most widely used, convenient, and generally available mode of using medicine, by introduction into the stomach. Swallowing a dose at stated intervals involves far less trouble and general annoyance than the other plans we have just passed in review, and, after all, is of almost universal application in ordinary cases. The teachings of physiology will remind the reader of the mechanism of absorp-

tion, and of the well-known principle of dialysis, by which crystalloid substances pass more readily through membranous walls than those of a colloidal nature. This explains the very rapid diffusive power of many saline drugs, a notable example being iodide of potassium, which appears in the urine thirty seconds after being swallowed, and some of the alkaloids, notably atropia, are no less rapid in their action. Occasionally, where patients will not or cannot swallow, we require to pump food, or drugs, artificially into the stomach, but, as a general rule, there is no difficulty on that score. It only remains for us now to consider the drawbacks we have to surmount.

First. The patient is made fully aware of the too frequently nauseous taste of his medicine, and we must endeavour to conceal this by flavouring ingredients, by capsules, or other means.

Secondly. Our drugs may spoil the appetite, injure the digestion, lower the tone of the system, cause nausea and depression and general discomfort, and this we may partly avoid by timing their administration at judicious intervals.

Thirdly. By coming in contact with various secretions, the remedy is much altered before it reaches the blood. The salivary, pancreatic, or biliary fluids on the one hand, and the gastric juice on the other, must largely neutralise acid and alkaline remedies, whilst some drugs may be rendered partly inert by stomach-digestion, or, like curare, may be eliminated too rapidly by the kidney to exert any poisonous influence when taken by the mouth. But we must also remember that these and other actions give us substantial therapeutic aid. The bile and pancreatic secretion aid the absorption of our oily remedies; and gastric juice aids the solution and absorption of quinine, antimony, and other drugs. Many purgatives only act effectually after previous solution in the alkali of the bile, &c.

4. Drugs are occasionally injected into the bladder, but its absorptive power is very limited, if it exist at all, and it is

usually only the mucous membrane which is locally attacked in this way by weak acids, alkalies, quinine, opium, and the like.

The drug having now obtained admittance into the blood by any of the channels we have enumerated, proceeds either to exert its physiological action on the healthy processes of life, or to modify in various ways those deviations from normal function which are commonly called disease. It is impossible to reduce to any brief or tabular scheme the infinite varieties and gradations of power possessed by the principal remedies of the Pharmacopœia, nor can we pretend to explain their selective tendencies: why sleep, and purgation, and vomiting, and a wide range of intricate nervous phenomena follow the introduction into the body of this or that substance. All we can do is to note these phenomena with discriminating care, to reduce them, when we can, to scientific principles, and then to consider their practical applications.

GENERAL RULES FOR PRESCRIBING.

Preliminary Considerations.

It will be well, before proceeding further, that I should lay down some broad rules which may guide us in the construction of prescriptions; and it seems best to introduce this subject here, instead of placing it, according to more usual custom, at the end of the book, as it is to be our aim and object to devote much care and attention throughout to the best modes of ordering drugs. Much professional credit may be derived from a good prescription, and as much damage done to the practitioner who orders for his patients mixtures which are neither agreeable to the eye nor palatable to the taste. It is well worthy of the student's attention to consider the most pleasant, effectual, and convenient way of ordering the remedies which are required by the sick, and at first he will no doubt consider this a very difficult task. This will partly depend on the fact that he has had the subject of doses

and therapeutical actions presented to him in such concentrated form that he will find some awkwardness in using practically the theoretical knowledge which he has laboriously obtained. The time at his teacher's disposal is so short that he has to run hurriedly from one drug to another, and bring into immediate relation remedies which differ so widely in their effects as to excite some not unnatural confusion in the minds of his hearers. It is therefore not an uncommon thing to hear students say that they do not think they will ever be able to remember the doses of the principal medicines. Then we must remember that, during attendance on out-patient practice, prescribing is either done on very routine principles, or considerations of time and convenience render it advisable to order most drugs according to registered formulæ, which are merely referred to on the patient's notes by name. Thus, although the student may know that dyspepsia may be treated by mist. alk. amara, or debility by mist. quiniæ, he would perhaps experience some difficulty in writing a prescription suitable for either case. In the wards, of course, he sees much more prescribing, but is perhaps not often called upon to do it for himself, so that when he settles down on his own account, it will be some time before he can handle medicines with that ease, confidence, and certainty which can only conduce to the comfort of his patients and his own ultimate success. Now, it cannot be out of place to urge upon him, here, the great importance of frequently exercising himself in this art. Let him put problems to himself; let him run his eye through his text-books, and endeavour to order the several drugs in varied combination; when he meets with the recommendation to treat a certain disease in a certain way, let him there and then expand these more or less vague directions into the form of a prescription; and so, at last, due blending of ingredients, with the avoidance of incompatibles and the concealment of nauseous properties, will come to him with perfect ease and efficiency.

Another point, the mere mention of which may cause a

smile, is the importance of occasionally inspecting, or even tasting, the mixtures we prescribe for our patients. Experiments of this nature will often do more to teach us the efficient combination of drugs than the most profound theoretical knowledge. It is by the experience gained in his own surgery that the country doctor is often found to order far more agreeable prescriptions than the hospital physician, and to steer clear of those hopelessly nasty concoctions which are occasionally sent out from the unwilling hands of druggists in obedience to the orders of scientific authority.

1. Combination of Drugs.

The first thing to be considered in writing a prescription is the object for which we order this certain combination of drugs, which symptoms in our patient's case do we wish to alter or modify, what is to be our principal ingredient, and in what quantity. This being duly settled in our minds, we reflect whether it is better to give this particular article by itself, or to combine it with other substances which may possibly assist or mitigate its action, or may at all events conceal its more or less nauseous taste. Now, it is a very commonly given recommendation that in our prescriptions we should aim at simplicity as much as possible, and this certainly holds good within certain limits. The old-fashioned custom used to be to string together a long list of ill-understood substances, in the hope that some one or other of them might hit the right nail on the head, and even now traces of this polypharmacy linger about medical practice. When, however, we are tolerably certain of the action of our drug, and more especially when we are making scientific observations on its mode of action, it is often of great importance that we should not obscure its effects by the addition of any other active substances, but order it either simply in distilled water, or merely combined with other ingredients for flavouring purposes. But we must remember not to carry this principle

too far. No fact is more thoroughly proved in therapeutics than the value, under certain conditions, of due combination, and the way in which one drug may assist the action of another.

Thus, taking the case of diuretics, we know well that a prescription containing three or four members of this group will often act where one produces little or no effect, and that mercury is of undoubted service in assisting the influence of squill and digitalis over the urinary secretion. Cough medicines are always best given in combination with a variety of drugs, and the same holds good of purgatives ; for we all know how hyoscyamus or belladonna will both aid and hold in check the action of colocynth ; how a little sulphuric acid and iron will promote that of sulphate of magnesia ; how jalap aids the peristaltic intestinal contraction to remove the watery fluid which cream of tartar drains into the bowels.

Moreover, we all gladly acknowledge the advantage to be derived by the addition of a little iron to the digitalis which we give as a cardiac tonic, and to the ergot which is to stimulate the uterine functions, knowing, as we do, the important rôle which an improved blood supply necessarily plays under these circumstances. Narcotics also often gain in potency by combination, for do we not know that bromide of potassium and chloral together will occasionally cause sleep where either separately would have failed ? Aromatics are often of great service in counteracting the griping tendencies of certain active purgatives, and the success which has been claimed in some special conditions for Warburg's tincture over quinine, is held to be due to the peculiar way in which the action of the active ingredient is reinforced by the somewhat complicated farrago of substances by which it is surrounded.

Arsenic is believed to prevent the unsightly acne produced by bromide of potassium ; and the best mode of obviating the discomfort of cinchonism consists in adding a little hydrobromic acid in our quinine.

Several alkaline medicines, given together, seem to act

better in rheumatic fever than the simple administration of one member of the group. Tonics, such as quinine and iron, are blended with advantage. Then again, we add one drug to another for the purpose of counteracting some unpleasant physiological effect; thus spiritus ammoniæ aromaticus mitigates the unpleasant symptom of iodism, atropia lessens the chances of discomfort which attend the subcutaneous injection of morphia, and hydrobromic acid lessens the deafness and ringing in the ears which is sometimes caused by quinine. Instances like this might be multiplied almost *ad infinitum*; but we shall develop the subject further as we go on, and refer frequently to the laws which should guide us in considering whether the various drugs are best ordered singly or in combination.

2. Form of Administration.

We must take into consideration whether we ought to administer our drug in a concentrated or diluted form, and here again we shall find it necessary to act very differently under different circumstances. As a general rule, we may lay down that the metals are best given either in pill or in a small quantity of fluid, and this remark applies more especially to those which have very active physiological properties. Thus we generally give arsenic and perchloride of mercury, or strychnia, in a state of only moderate dilution. Salts, on the other hand, and more especially the purgative salts, act best when taken in large quantities of fluid, and we shall find in practice that iodide of potassium is decidedly more efficacious when freely diluted, that sulphate of magnesia follows the same rule, and that in the case of diuretics also we may aid their action by combining the directly flooding or mechanically sluicing effect on the kidney of large quantities of watery fluid.

3. Period of Administration.

The period of administration is also well deserving of careful study, and we may indicate one or two useful rules with regard to the action of alkalies and acids. As acids check acid secretions, and alkalies have a similar influence over those with alkaline reaction and *vice versa*, we can readily understand the effect which they may exercise over digestion. Thus an acid given directly before a meal must interfere with the due assimilation of the nitrogenous articles of diet by checking the supplies of gastric juice, whereas an alkali given at the same time must theoretically produce the best results by stimulating that secretion. If, on the other hand, we give an alkaline medicine after food, we do harm by directly neutralising the acid on which some part at least of the active principles of the gastric juice depends.

Drugs which have a distinctly lowering or irritating effect on the system are best given with or after meals, so as to prevent these results as far as possible ; thus we always give arsenic or corrosive sublimate or strychnine at these times, and find that they are well borne by persons who could not take them on an empty stomach. For a different reason, again, we generally find it convenient to prescribe cod-liver oil after food, not only because it is less likely to cause sickness when given at that time, but because oily matters, being absorbed by the lacteals, are most readily taken up when these structures are in full working order, and when they may be most conveniently acted upon by the biliary and pancreatic secretions.

Again, when we wish to imitate or to excite a normal physiological action, we must time our drug accordingly. Opium, or any other narcotic, is much more likely to produce sleep when taken at night than at other times, and a mild purgative in the morning will often stimulate the peristaltic movements of the intestines to evacuate the bowels at the

time when they are accustomed to act. And when we wish to re-excite a suspended menstrual flow, we will find our best chance of success in directing our remedies more especially about the time at which the monthly period ought naturally to appear.

The efficacy of purgatives is also markedly aided by a due consideration of the periods at which they ought to be given. A resinoid cathartic principle contained in pill is usually of slow and deliberate action, and may be given indifferently with meals—as in the case of dinner-pills—or on an empty stomach before bedtime; but saline purgatives generally act best when given fasting, as the veins of the intestinal tract are then less full and more predisposed to rapid absorption. As an illustration of this we need only refer to the much more potent effect of an ordinary seidlitz powder given before than after breakfast.

Anthelmintics, again, are always best given after as long a fast as possible, so that the parasites which they attack may not be shielded by food or mucus, and we find in practice that night or early morning is the most convenient period for their administration.

4. Dosage.

The relative efficiency of large and small doses is the next point which has to be taken into consideration; and here we are at once confronted by some of the most delicate and difficult questions in therapeutics—delicate because they border closely on the dangerous ground of homœopathy, difficult on account of their often unsettled nature. We cannot pretend to give any exhaustive discussion to this branch of our subject, because the materials for it are not forthcoming, but we can all contribute somewhat to its solution by experimental trials of various drugs given in these different ways. This much, however, we do know, that in many cases we get far more satisfactory results in special emergencies, or temporary

conditions, by giving one tolerably large dose at one time; and especially is this the case with narcotics, small quantities of which only excite or annoy, whilst a full dose satisfactorily brings about the desired result of sleep. Purgatives and emetics, again, are also best given in one considerable dose; tonics, astringents, and diuretics require to be steadily repeated at certain short and regular intervals in order to have a sustained and continued effect. But the true point at which we wish to arrive is this: Can we best obtain rapidly and efficiently the constitutional action of a drug such as belladonna, or aconite, by administering in average quantities two or three times a day, or by ordering it to be taken in very small doses often repeated? Now, supposing we are called upon to treat a case of acute tonsillitis or catarrhal febrile disturbance, which we wish to remove as rapidly as possible, and we elect aconite as the special remedy to be used, the most reliable method for its administration is in drop or even half-drop doses every hour, half-hour, or even ten minutes. General experience has pretty well confirmed this teaching, and has extended it to other medicines, such as prussic acid, which will thus more effectually control urgent sickness than when given at longer intervals in the more canonical way; to tartar emetic, which in very small and oft-repeated quantities exercises a remarkable effect over infantile bronchitis; to ipecacuanha, which in minim doses will frequently check obstinate vomiting; to calomel and grey powder, which in minute doses, every half-hour, will often stop irritability of the stomach when nothing else will succeed. Instances of this sort will be multiplied as our consideration of the individual articles of the Pharmacopœia goes on, the principle being steadily kept in mind that we may often bring the system much more efficiently under the special influence of a drug by ordering it in small quantity often repeated, than by giving full doses two or three times a day; and this necessarily applies with special force to those drugs which are rapidly thrown out of the system, and whose action upon the structure or function they are particularly

supposed to affect, is thus kept up and, so to speak, perpetuated, by very frequent administration.

On the other hand, we must not forget that certain medicines must be given in very large quantities before their physiological properties are obtained. Thus it would be useless to expect succus conii to tranquillise irregular muscular movement in less doses than f℥j. Frequently we are required to give even more than this. Belladonna is of no use in nocturnal incontinence of urine unless boldly pushed up to f℥j. or f℥jss. of the tincture. Arsenic acts best in chorea when prescribed with no timid hand.

Another point of interest in connection with this inquiry is, that drugs often display different and even opposing actions, according as they are given in large or small doses. Thus we have seen that drop doses of vin. ipecac. will often check vomiting, whereas it is well known that a teaspoonful or even less will almost immediately evacuate the stomach. Sulphate of zinc, in twenty or thirty grain doses, is prized as our best emetic, whilst it is equally established that from one to ten grains is a valuable nervine tonic, much used by some physicians in the treatment of chorea. Small doses of opium excite, whilst large soothe into sleep. Half-ounce doses of infusion of digitalis may be more safely given than those of f℥j. more frequently repeated. The neutral salts of potash and soda are, as a rule, purgative in large, diuretic in small, doses; and the other instances of this principle—which will afterwards be given—must be borne in the mind of the prescriber before he can pretend to make most efficient use of the weapons at his disposal.

5. The Interval between Doses.

The next heading to which reference is usually made is regarding how often we ought to repeat our dose of medicine; but this is so far involved in what has gone before that very little remains to be said. The ordinary rule is to order our

mixture to be taken three times a day, or every four hours, unless special circumstances, such as we have already indicated, render it advisable to repeat more frequently. Although many sick persons look forward to the time of taking their physic, and feel moral as well as physical support from the mere act of attending to their doctor's orders, the greater proportion are not so favourably impressed, and would willingly be relieved from the necessity of swallowing the often nauseous compounds they receive. Homœopathists, no doubt, derive much of their success from the tasteless nature of their medicines, and we have not yet devoted sufficient attention to the elegancies and refinements of pharmacy. It is well, therefore, to direct our tonics and astringents and drugs, whose action is to be spread over some considerable time, to be taken three times a day, always bearing in mind those important exceptions which recent investigation has done such good service in impressing upon our attention.

6. Individual Peculiarities; Idiosyncrasy; Habit.

When the student has been fairly emancipated from the leading-strings of his teachers, and enters practice on his own account, he will often be disappointed at the way in which drugs play their allotted parts. The necessarily cut-and-dried and dogmatic descriptions of the text-books have led him to believe that such and such a medicine will always act in a particular way, and he accordingly prescribes it with full confidence in a given case. But not only may the proper effects fail of development, but very unpleasant and almost unlooked-for symptoms may follow its use, which will be productive of much discomfort and uncertainty, and may even tend to shake his professional credit. The influence of that strange individual peculiarity, usually termed idiosyncrasy, and of which no reasonable explanation has ever been given, must be very carefully taken into account in prescribing, and we shall refer to it on all suitable occasions. Sometimes it renders our

patient unduly susceptible to the action of drugs, and thus we may find one person seriously salivated by one grain of calomel, another who dare not touch quinine, a third who is furiously excited by opium, whilst a fourth may be poisoned by a single grain of morphia. Phosphorus and bromide of potassium also occasionally cause their peculiar effects in very small doses. A good precaution, therefore, is, before prescribing any of these drugs, to ascertain from the patient whether he has ever taken any of them before, and whether uncomfortable effects could be in any way attributable to their use. But, on the other hand, our patient's constitution may be such that very large quantities of drugs will alone succeed in acting; and remarkable stories are told by Christison and others of the immense quantities of opium which persons quite unaccustomed to its use have been occasionally able to take with impunity. Purgatives act very differently on different people, and some require immense quantities of anæsthetic vapour before full insensibility is obtained. Although, as I have just said, we may often anticipate uncomfortable effects by due preliminary inquiry, it too often happens that they come on suddenly and quite unexpectedly. Idiosyncrasy is so wide-spread and deep-rooted in the human constitution, in almost every function and action, that we can hardly hope ever to obtain the key to its mysteries. Why, may we ask, do particular articles of diet disagree with special persons? Why does one person, on exposure to cold, take a simple catarrh, whilst a second becomes a prey to rheumatic fever, and a third escapes unharmed? Until we can clear up these problems, it is vain for us to attempt to explain why we require to adapt our doses so carefully to individual constitution and peculiarity; and the reason why the student is at first perplexed by all this is that we meet with these differences much more frequently in the upper ranks of society. The hospital or dispensary patient swallows any dose, however nauseous, with much satisfaction, and is much less often affected by those troubles of irregular physiological action

which so frequently harass the family medical attendant in more aristocratic circles.

The power, therefore—and a power unfortunately too often uncommunicable to others—of appreciating the peculiarities of different persons, in respect of their 'behaviour' towards drugs, is just one of those 'knacks' which go far to make up success in practice. We ourselves often wonder, or share the surprise of others, why certain doctors, whose scientific attainments may be none of the highest, attract and retain in a remarkable way the confidence of their patients; and we may be sure that something beyond mere luck, or manner, or accident is the true secret of their superiority. Tact in the use of remedies is no doubt in some degree the lever which has raised them to their positions, and more especially the power which well-remembered experience has conferred upon them, of knowing intuitively, as we sometimes call it, what drugs will best agree with the individual sufferer. We yet know nothing of idiosyncrasy beyond the uncomfortable fact of its frequent and unsuspected existence, and, in proportion to our ignorance, all the more keen and persevering should be our search after those laws which must inevitably regulate its action. For the further elucidation of our own eccentricities in this way we must mainly trust to the labours of family doctors; and it is to be hoped that the Collective Investigation Department of the British Medical Association, which is now doing such good work, will eventually turn their attention to therapeutical problems, and obtain from general practitioners some record of the experience gained by them in their wide field of observation.

The influence of habit on therapeutics is also worthy of every consideration, for we find in practice that medicines often lose their effect when continued during any lengthened period. More especially is this the case with opiates and narcotics generally, the dose of which requires to be gradually increased from time to time. Arsenic has the same peculiarity, as is shown in the case of the arsenic-eaters of Styria, who, by

long continuance in the use of that substance, are at last able to consume quantities which would inevitably prove fatal to a novice. And this leads to the question of *toleration*, an old-fashioned term dating from the days of heavy dosing with irritating metallic substances, but having sufficient bearing on modern practice to justify its consideration here. We have said that the term toleration savours somewhat of antiquity, because the great illustration of this principle used to be afforded by tartar emetic, which was then much more freely used in acute inflammations than now; and when I say antiquity I do not refer to anything more remote than perhaps half a century ago. Then the contra-stimulant treatment of pneumonia was in full swing, and the curious fact became gradually known that, although the first doses of tartar emetic often caused much nausea and depression, subsequently larger quantities were well borne; and this was explained by what was called toleration of the drug being established in the system. It will be seen, when we come to consider in detail the actions and uses of tartar emetic, that a very sufficient and scientific explanation can be given of this somewhat mysterious effect. In these days inflammatory action is treated on somewhat different principles, and antimony is comparatively little used; but the principle of toleration can be recognised in the use of other drugs. Thus, in dysentery, quantities of ipecacuanha are given which would infallibly produce violent vomiting in a healthy subject; arsenic is better borne in skin disease than in a state of health; choreic patients are able to swallow almost emetic doses of zinc sulphate without the action of vomiting being induced. Digitalis is well known to be given freely in delirium tremens, and there is little doubt that the experiment of prescribing half an ounce of the tincture to a person in ordinary health would be productive of serious, if not fatal consequences. Further instances of toleration might readily be adduced, but it will be much more to the advantage of the student to recommend him to pick out other examples for himself than to provide him with a cut-and-dried list of all that is known on the subject.

7. Accumulation.

We next come to what is commonly known as *accumulation*, the theory of which is that certain drugs rest or become stored up in the system until they reach a dangerous quantity, when inconvenient or poisonous symptoms may result. Thus we know that after a certain continuance in the use of digitalis, faintness and depression have often been observed; that strychnia may cause uncomfortable twitchings after it has been taken for some time; and that bromide of potassium only begins to cause annoyance when the system seems to have become saturated with the salt. Does this really mean that these substances have gone beyond the point at which their poisonous action is neutralised, so to speak, by the symptoms which their therapeutical powers attack; or is the defect in the organs of elimination which fail to expel them efficiently from the system? It is probable that both these and the numerous other examples which our subsequent pages will contain depend upon both these causes in some degree, in addition to another, and that is that the organ or tissue towards which the physiological action of the drug is directed is, after long-continued stimulation by repeated small doses, worked up into a certain condition of special excitement or depression, and discharges accordingly. Thus we find the twitchings from strychnia, the cardiac depression of digitalis, the nervous weakness and ataxy from bromide of potassium, the paralysis resulting from alcohol. The metals, as mercury, arsenic, &c., on the other hand, no doubt act by being stored up within the tissues, being brought into excessive action by some defect of elimination.

And the practical outcome is, that in ordering many of these drugs, and more especially digitalis, belladonna, strychnia, and bromide of potassium, it is well to have an occasional break, to omit our prescriptions for a day or two, so as to give the parts a rest, and enable the remedy to act afterwards with

better effect perhaps in even diminished dose. It may happen that some of these uncomfortable effects are caused by defects in the organs of elimination. It is very important, therefore, when prescribing certain drugs, and more especially salicylic acid, to satisfy ourselves, by careful examination of the urine, that the kidneys are in thoroughly good working order.

8. Chemical and Physiological Incompatibilities.

And now we come to the doctrine of incompatibility, which is of all-essential importance in therapeutics, consisting as it does of the principles which we require to know in order to avoid that amount of clashing of the different ingredients of our prescription which may either alter or destroy their action. Now, incompatibility may be of different sorts, and is generally divided into chemical and physiological. Of these we will first consider chemical incompatibility.

This consists in the chemical action of one drug on another, which may result in the formation of a new compound when they are mixed. Thus the addition of iron to decoction of cinchona will produce an unsightly, black mixture; strychnia and perchloride of mercury will not go with gelatine; sulphuric acid and lead form an insoluble sulphate. A good deal of this incompatibility, however, is inconvenient, principally because the resulting solution is often thick, turbid, and unsightly, and therefore repugnant to the patient. Many most incompatible mixtures are therapeutically efficient, and some are even prescribed deliberately. Quite otherwise is it, however, with the second group, or the physiological incompatibles, the *rationale* of which is that the action of one drug is so far antagonistic to that of another that the mixture of the two is necessarily inert. Thus the action of belladonna and opium is in some degree opposed, so is atropia and prussic acid, aconite and digitalis, strychnia and Calabar bean, and, most markedly of all, caustic alkalies with belladonna,

hyoscyamus, stramonium, or tobacco, all of whose active principles are thus absolutely destroyed.

But, as already hinted, we often prescribe an incompatible mixture for the purpose of actually deriving therapeutic advantage from the resulting compound. Thus, what is a more generally used and, I may confidently say, more useful prescription than bichloride of mercury and iodide of potassium, making an iodide of mercury, which is much more efficacious than that salt itself as prepared by more elaborate chemical agency? Again, the far-famed mist. ferri co. derives much of its charm from the freshly prepared carbonate of iron which results from the due combination of ferric sulphate and potassium carbonate. Black wash is another example; and although corrosive sublimate and decoction of bark are undoubtedly incompatible, no better means is known of counteracting the depressing effects of this preparation of mercury.

Some of the principles of incompatibility, as applied to the writing of prescriptions, may be conveniently formulated in the following scheme, for which I have to thank my American editor, Dr. Frank Woodbury:—

General Principles of the Incompatibility of Drugs.—1. As a rule a drug is incompatible with its *antidotes* and its *chemical tests*, especially if the latter depend upon the forming of an insoluble precipitate; thus metallic salts or albumen should not be prescribed with substances containing tannin, nor chlorides with nitrate of silver. Therefore, in combining soluble salts with each other, or with infusions, be careful to see that an insoluble precipitate is not unintentionally formed.

2. The alkaloids are precipitated by tannic acid and caustic alkalies, and may be destroyed by chlorinous compounds.

3. The alkalies, as a rule, precipitate metallic salts.

4. Mineral acids decompose salts of vegetable acids, and other salts where they have a superior affinity. They form ethers with alcoholic preparations.

5. The glucosides, such as salicin, santonin, and colocynth, are decomposed by free acids, or emulsin.

6. Tinctures in general deposit resin on adding water, which also precipitates iodine from its alcoholic solution. Infusions containing tannic acid are incompatible with metallic salts generally.

Special Incompatibles.—In accordance with the first rule given above, the table of antidotes placed at the end of the book will for the most part suggest the individual incompatibilities.

The following should always be exhibited alone, or simply dissolved in distilled water: corrosive sublimate, tannic acid, strychnia, preparations of lead and of iodine, and nitrate of silver. With glucosides, or creasote, the latter forms an explosive compound, and should not be prescribed with vegetable extracts.

A mixture of chromic acid and alcohol is explosive, and so is chlorate of potassa, when powdered with sulphur or tannic acid.

Aromatic waters sometimes precipitate metallic salts, on account of containing a small amount of carbonate of magnesia.

Syrup of squill and of garlic contain free acetic acid, and are incompatible with carbonates.

Tincture of chloride of iron precipitates quinia from the solution of quinia sulphate, but to a small extent dissolves it when in large excess.

Solution of acacia gelatinises with tincture of the chloride of iron and with borax. It is precipitated by solution of subacetate of lead, and by alcohol.

9. Prescribing for Children.

A few words may now be said on the art of prescribing for children, a subject which is only incidentally touched upon in our ordinary books, and is then treated in a somewhat misleading manner. Elaborate tables have, however, been drawn up for the regulation of doses according to age, and in all of these it is assumed that young children necessarily require

much smaller doses of most drugs than adults; and this is true in so far that it is seldom advisable to deal out our mixtures to them in the time-honoured tablespoonful or two tablespoonfuls of their elders. But the important fact which these systems invariably ignore is this, that children can often take, not only with impunity, but even with decided benefit, quantities of active remedies which will correspond to the full adult dose. And the reason for this may be looked for in the much greater destruction and construction of tissue in early life, whereby the organs of elimination are in unusual activity, and hence disposed to excrete medicinal substances with special promptitude. Whether we accept this explanation or not, however, I may warn the young practitioner that an adherence to the rules usually laid down for children's prescriptions will cause him serious disappointment, and that he will be surprised at the beneficial results which will often follow the adoption of a bolder course.

To furnish a few examples of this proposition I will begin with belladonna, which may be used very freely in childhood, and the dose of which I have pushed, in a child of ten years of age suffering from incontinence of urine, to f℥ij. with good effect, and the development of only very mild forms of physiological disturbance. I commonly begin with ♏xx. in a child of two or three, and have prescribed ♏x. in an infant of six months with remarkable benefit; and the result of my experience undoubtedly is that children bear belladonna actually better than grown-up persons, and that in them really poisonous symptoms rarely if ever occur.

Arsenic may also be freely given to children, and, at the age of five or six, I should have no hesitation in beginning with ♏v. [of Fowler's solution] and pushing even up to ♏x. if necessary. Strychnia is also well borne. Tinct. ferri may be taken in large quantities, and I have seen excellent results follow the administration of f℥j. ter die in a little girl of six years.

Children will often require large purgative doses, more

especially of pulv. jalap. co., and of ipecacuanha as an emetic. I have often ordered quantities which have startled the dispenser, and induced him to come for explanation under the idea that I had made a mistake. Other instances will be noted as we go on, remembering always the sound old advice to be very careful with opium at an early period of life. Every practitioner has, no doubt, seen cases in which ill results have unexpectedly followed laudanum prescribed before the age of one year, and I cannot do more than reiterate the warnings on this subject which every manual of materia medica most properly contains. The explanation of this possibly enough may be that the open fontanelles of early childhood permit a much more sudden and effective increase in the quantity of blood contained within the skull than in adult life, and some confirmation of such an opinion may be found in the fact that very young infants will usually bear large doses of those narcotics which act by causing anæmia of the brain, and notably of chloral hydrate, which I have prescribed with benefit in five-grain doses thrice a day to a little child only twelve months old. It is important to remember that below the age of one year bromide of potassium is ill borne by children, having a tendency to cause a pustular rash, and it is also well to be cautious in using iodide of potassium at this early age.

It is always well to make our dose as small as possible, one or two teaspoonfuls being usually sufficient, and great pains must be taken, by means of well-adjusted flavouring ingredients, to disguise the too often nauseous taste of our drugs. Various syrups and aromatic waters here stand us in good stead, and it is well, if possible, when dealing with very young infants, so to reduce the bulk of the medicine as to enable it to be mixed unobserved with milk, veal-broth, beef-tea, or some sort of confection. In this there is nothing really antagonistic to the principle which has just been developed, as we can readily enough give considerable quantities of belladonna, arsenic, &c., in comparatively small quantities of water, or even in none at all.

Children, are, however, somewhat strangely capricious in their taste; for whilst they object decidedly to bitter or acid substances, they readily swallow oils, and generally seem to derive satisfaction from sucking in cod-liver oil. Nauseous powders, which would seem inexpressibly revolting to their elders, they often take well, and by a little contriving and consideration we can generally manage to persuade them to consume their dose with philosophic composure, if not with actual relish.

We may now briefly consider two very interesting points.

First, the effects of drugs administered to a nursing mother on the child. Of this, of course, we have ample evidence, knowing, as we do, of the elimination of many medicines by the milk, such as iodide and bromide of potassium, rhubarb, lead, and opium. We often find that infants are griped and made uncomfortable by their mother's medicine, and we must remember this in prescribing, even if we are allowed to forget it by the patients themselves, who are usually well informed on this point. But little advantage has hitherto been taken of this way of treating young children, and it seems hardly admissible to recommend a larger recourse to so roundabout a plan, as some of the substances used in this way might check the secretion of the milk by impairing the health of the mother, and as there is no real difficulty in giving effective doses of therapeutic agents to children even at so early an age.

When we come to number two, however, some interesting speculations are encouraged, for we have to consider in how far we can modify or affect the condition of the fœtus in utero by drugs administered to the mother. There is no doubt that a strain of syphilitic infection has been arrested by mercury given to the mother during pregnancy, and that the infant thus vicariously treated was the first out of a long series which proved to be free from all specific taint. Iodine and salicylic acid, quinine, santonin, and nitrate of potash have been detected in the urine of the fœtus whose mother had taken those substances, and Dr. McClintock, of Dublin,

records six cases in which the regular recurrence of abortions was checked by giving iron and chlorate of potash [1] to the mother. For a full ventilation of this subject, and a large mass of evidence and opinions on either side, we may refer the reader to a discussion in the New York Obstetrical Society, January 1877.

It is probable that drugs given to the mother at the time of labour are more liable to injure the child than during the period of pregnancy, because of the interference with the eliminating function of the placenta.

10. Prescription-writing.

We next come to the construction, or what we may call the anatomy, of the prescription itself, how it is put together, and how its component parts are arranged; and we commence with the '℞' with which it begins, and which really means an old invocation to Jupiter. But, conventionally, it has been held to imply the verb *recipe*, which governs the quantity in the accusative, the name of the medicine being put in the genitive. Thus, *Recipe* (take) *pulveris* (of powder) *scammoniæ* (of scammony) *scrupulum* (a scruple), &c. Other directions are laid down in books which deal with this question, and much valuable information is contained in Pereira's 'Selectæ Præscriptis' and the clear and instructive little work of Dr. Griffith, of Dublin; but it is hardly necessary to reproduce these here, as students beginning their medical curriculum are presumably sufficiently well grounded in classics to enable them to understand the very moderate amount of Latin required for their use in prescribing. As a rule, most medical men write their directions nowadays in English; and this has not only the advantage of limiting the chance of mistake, but it does away with much of that mystery which beyond anything else has tended to keep back the progress of

[1] *Brit. Med. Journ.*

our art. In these enlightened times, when even more than a smattering of physic is commonly possessed by the laity, we do not find our patients quietly consenting to be kept in the dark as to what medicines they are taking. Rather do we find them showing a keen interest in our prescriptions, anxious to inquire, and argue, and, if possible, understand all about the line of treatment we have determined to pursue. The cases are very rare in which it is necessary to conceal from them the presence of any particular drug in their mixture, and Latin directions are therefore not only unnecessary, but pedantic in the highest degree. It is still, however, the custom at examining boards to ask the candidates to write and to read prescriptions fully constructed according to this custom, and in the prescriptions which we shall frequently add to our descriptions of the various drugs we shall invariably give the directions in Latin of the usual form.

It only remains for us, then, to add the signs and symbols in general use, which are as follows :—

gr., granum . . .	= a grain.
℈, scrupulum (scruple) .	= 20 gr.
ʒ, drachma (drachm) .	= 3 scruples or 60 grains.
℥, unica (ounce troy) .	= 480 grains.
lb, libra (pound) . .	= 12 ounces troy.
♏, minimum (minim) .	= 60th part of a fluid drachm.
gtt., gutta (drop) . .	= usually about ½ minim.
O, octarius (pint) . .	= 20 ounces.
C, congius . . .	= a gallon.

In the British Pharmacopœia the time-honoured drachm and scruple weights have been discarded, and all who prescribe or dispense medicines are recommended to discontinue their use ; but old-fashioned customs are not so readily swept away, and we accordingly find these most convenient terms flourishing as much as ever. In domestic practice we find a much more rough and ready mode of prescribing, the generally received measurements being as follows :—

Teaspoonful	= 1 fluid drachm.
Dessertspoonful . . .	= 2 fluid drachms.
Tablespoonful . . .	= 4 fluid drachms.
Wineglassful	= 1½ to 2 fluid ounces.
Teacupful	= 5 fluid ounces.
Breakfast-cupful . . .	= 8 fluid ounces.
Tumbler	= 10 to 12 fluid ounces.

Of all domestic modes of measurement, however, none can equal the drop in fallacy and danger. The size of a drop is influenced first by the shape of the bottle, and secondly by the quality of the fluid itself, and hardly two substances will be found to contain the same number of drops in a given quantity.

Tablespoons, teaspoons, and all domestic measures are most absurdly variable in size, and we shall do well steadily to discountenance their use in all cases, and to insist that our patient shall carefully regulate his dose by means of those graduated glasses which are within the reach of all but the very poorest.

Although it would manifestly be lulling our readers into a false security were we to attempt to lay down any absolute rules respecting dosage, we may venture to state some broad principles which will help the memory. Students often complain of the great difficulty they experience in remembering doses, and at first sight it would appear a most irksome task for a person not in the habit of prescribing to carry in his mind the major and minor quantities of drugs which he may safely order. But by giving a few rules, and adding exceptions, as in the Latin grammar, we hope to show that no real difficulty exists, but that we may safely group substances in such a way as to associate their doses with tolerable simplicity. But first let me say one word about the British Pharmacopœia. Constructed as it was by official authority several years ago, it is naturally looked upon as our *vade-mecum*, and every student is supposed to possess a copy and

to make himself familiar with its contents. In the first edition no doses were given, and in the next, although these were added in deference to a universal request, it was expressly stated that they were not to be considered authoritative, or specially enforced by the Medical Council. But the Pharmacopœia, being the only official guide, has now been forced into a position respecting dosage which it did not intend or desire, and we therefore find that in any case of difficulty its authority is invariably appealed to. It lies on every druggist's counter, it is the standard in courts of justice, and this being the case, it ought to reflect the most advanced researches on its subject. But this is not so; on many points its recommendations are hopelessly at variance with modern practice, and we are hence exposed to the annoyance and possible discredit of having our prescription sent back or cut down by druggists who are afraid of exceeding the dose sanctioned by authority. Thus, the maximum dose of succus conii is fixed by the Pharmacopœia at ʒj., of quinine at gr. x., tinct. digitalis ʒj.; and when we come to consider the various substances in succession, we shall find many other examples of a discrepancy between my teaching and its statements, which this explanation will clear up.

We may now proceed to indicate the natural system of grouping, by which some order may be given to the arrangement of the doses of drugs in the already crowded brain of the student or the young practitioner.

Thus let him remember that, as a general rule, tinctures may be prescribed in doses of from ʒss. to ʒij., infusions and decoctions from ℥ss. to ℥ij., powders from two to ten grains, pills four to ten grains; and although there are numerous and very important exceptions to this, the recollection of the principle will spare us from the drudgery of placing the exact dose after every preparation whose action we shall examine.

These rules may be borne in mind in a general way, and we shall now go on to consider very briefly the plan of arrangement to be pursued when we come to consider the various

medicinal substances seriatim. Our object will be to balance, as far as possible, their physiological against their therapeutical action, arranging them in corresponding columns in diagrammatic form; and it will greatly assist this arrangement, as well as aid the memory of the student, if we adopt the following order in stating what we know respecting the properties of each drug.

Take, first, its local or external action.

Then its influence on the brain and on the spinal and sympathetic system of nerves.

This will lead us up gradually to the effects on the heart and blood-vessels, whose functions are presided over and ruled by nervous influence.

The effects of the drug on respiration and temperature will next be considered, and we proceed to the alterations of secretion in the following order: urinary, intestinal, salivary, cutaneous, &c.

Then other actions which come under no heading, and which may be called specific.

Finally, we must consider the various modes of elimination from the body, the antidotes, contra-indications, and best modes of prescribing, winding up, in most cases, with a prescription which will, as far as possible, combine efficiency and elegance with palatability.

Regarding the method in which the following pages will be arranged, a few words may be said.

Different modes of grouping drugs have been adopted, and by some the preference is given to the purely physiological plan, by which all the medical substances having a particular action are placed under that special heading; thus, we have purgatives, narcotics, astringents, &c., as different varieties, with their attendant species. No doubt such a plan has the merit of scientific precision, and, had each drug only one medicinal action, nothing could be simpler or more effective than this arrangement, of which Neligan is the chief exponent. But an unfortunate element of complication is introduced by

the fact that one drug may act in many, and indeed opposing, ways. Thus, whilst opium is an astringent, it has every right, under certain circumstances, to be called a purgative; its stimulant action is as evident as its narcotic; it is a diaphoretic, a sedative, an antiphlogistic; and the confusion inseparable from hunting it about among its various headings must necessarily be perplexing to the mind of the student, as well as occasion loss of time. Many other drugs behave in the same way, so it has been thought best to adopt the arrangement of Garrod and other popular text-books, in which the inorganic substances are placed alphabetically, and the organic in accordance with the natural orders to which they belong. We shall only venture to make one modification, and that will be to remove the general principles of therapeutics from their usual position at the end of the book, and scatter their classification systematically through our pages. For instance, after treating of the leading member of the purgative or narcotic group, we shall use that as a peg on which to hang a general description of that class of substances in general, and in this way we may hope to relieve that tedium which is apt to arise when too many deductions and generalisations are presented *en masse*. The brief space necessarily at command in the following pages, and the dogmatic tone so necessary for teaching, may possibly tend to create in the mind of the reader an undue confidence in the curative power of drugs. Unhappily we cannot emulate the confident faith of homœopathists, who label their tinctures and globule bottles with the names of special diseases which the contents are believed infallibly to cure. We have as little admiration for this overweening confidence as for the scepticism of some modern writers, who would fain have us believe that drugs have no influence over the processes of disease. Nothing can be more paralysing to progress than this tone of thought, and we should recommend to our readers in preference an excess of faith, and an earnest determination to work out the clinical bearings of therapeutics.

Experiments on animals have done good service; and we have only to point to the brilliant researches of Rutherford in proof of this assertion; but what is even more wanted are accurate and extensive trials of drugs in practice by well-instructed general practitioners. Extended and well-recorded observations from the wide field at their disposal will not only be cordially received by the profession, but will be of real service in giving us data from the only sure basis on which we can build up our opinions and practice with reference to the real actions of drugs.

Convinced although I am of the great importance of drug treatment in many diseases, one of the first lessons to be learnt in practice is the infinite value of careful watching and nursing, feeding, and general hygienic arrangements.

The importance, for instance, of free ventilation, of open windows without draught, of fires as ventilating agents, of the prompt removal and disinfection of all discharges, of quiet, firm, and skilful nursing, of well-arranged bedding, including quiet, and the careful exclusion of the beams of early morning light, are points of importance only to be thoroughly appreciated by the practitioner.

The well-instructed medical man will do well to make some little study of cookery, so as to devise and even superintend dainty dishes for the sick, as well as to see that the beef-tea is clean and strong, and the general dietary varied and appetising. He must remember the necessity for forbidding solid food in acute disease, but most especially in acute rheumatism and enteric fever, the evil influence of starch or sugar in diabetes, of an excess of nitrogenous or saccharine articles of diet in rheumatism and gout. And when the acute symptoms have gone by, and convalescence is established, he must be able to recommend to his patient the best form of change of air; of foreign spa or bath, of Swiss or Scottish air, unless he is prepared to lose caste at a time when such knowledge seems of greater value than even the more special familiarity with drugs proper.

WATER.

Water, both in its external and internal applications, enters so largely into medical practice, as well as into domestic economy, that we cannot begin our studies better than by considering very briefly what is definitely known regarding its physiological and therapeutical properties.

Local Action.

It will be found difficult, if not impossible, to balance the physiological and therapeutical actions of water in the manner followed generally throughout this work, and we shall therefore give a short collective sketch of the influence exerted by it on the various functions of the body.

It is not necessary for us to do more than refer to the universal use of water for washing and bathing purposes, but a word or two on the physiological effects of cold baths is required. We find that the action of the heart is increased, the respiration may become panting and irregular, the temperature falls, and the destructive metamorphosis of the tissues is augmented, as indicated by an increased excretion of urea; occasionally albumen appears in the urine, and so much mental shock is produced, more especially by sea-bathing, as to render this usually excellent tonic unadvisable in those of feeble constitution, in the very young and old, and in pregnant women, whilst the tendency to vascular strain must prescribe caution towards those in whom we have any reason to suspect a degenerated state of the arterial system.

Occasionally, during sea-bathing, the hair falls off, the process of digestion becomes impaired, and sleeplessness is experienced; and this, no doubt, arises from the process of tissue destruction not being thoroughly balanced by repair.

As regards the external uses of cold water in medical prac-

tice, we may refer to the beneficial action of water-dressing and irrigation in surgery, to cold affusion in laryngismus stridulus, chorea, hysteria, the stupor of fevers and drunkenness, and, most of all, to the wonderful refrigerant action of cold baths in cases of abnormally high temperatures.

It is generally held that a fatal result almost inevitably occurs in any case where the temperature remains above 107°, and until very recently we were powerless to check the destructive influence of this complication. Within the last few years, however, Dr. Wilson Fox and others have shown that we may safely and effectually bring down this excessive heat in rheumatism, where it principally occurs, by placing the patient in a bath at 95° and gradually adding cold water or ice until 60° Fahr. is reached. In this way a reduction of from seven to twelve degrees may readily be effected, and we must remember one practical point, that the patient's temperature continues to fall, as much even as six degrees, for forty or fifty minutes after he has been removed to bed. Four or five baths may be required during the first day of treatment, the patient remaining immersed during twenty or thirty minutes; and there can be no doubt that by watching our cases of rheumatism carefully, and adopting this mode of treatment whenever the thermometer registers more than 105° Fahr., we may save many lives. We may remember that the lowering influence is in inverse proportion to the weight of the body, and that the best effects are produced when the temperature has a natural tendency to sink, as from seven in the evening till two in the morning, and again from eleven to two in midday. Beware of collapse, which is no imaginary danger, and must be met by stimulants.

The Germans use the cold bath very freely in all febrile disorders, Liebermeister keeping his bad cases immersed for even two hours, and their success in diminishing the death rate seems to be considerable. Much variety of opinion exists on the subject in this country, and a discussion at the Medical Society of London on cold bathing in enteric fever may be

read with profit (vide 'Transactions,' vol. vii.), and from it we may come to the conclusion that no very marked influence on mortality has been produced by systematic cold bathing, but that metabolism may be diminished, and some of the more characteristic symptoms of the typhoid state lessened in severity. Broadbent's rule seems a good one—to use cold sponging when the temperature reaches 102°, and not begin the bath until the thermometer records 104°.

Cold packing is an excellent stimulant to the skin; it is extensively employed at our hydropathic establishments, is useful as a less effectual but more agreeable mode of using antipyretic treatment, and is of service in the acute eruptive disorders when the rash recedes.

Warm water is also very serviceable, and we may mention the soothing action of warm fomentation, the hot *douche* in early joint disease, and the use of the warm bath in the convulsive diseases of children, for the relief of colic, spasmodic stricture, hernia, gall or renal calculi, and in cases of extensive burns or moist skin diseases, employed after the manner of Hebra, whose patients frequently remain in a state of continuous soaking for days together.

Ice is a most valuable application for relieving pain and checking inflammation in orchitis, bubo, meningitis, &c., as well as for the arrest of hæmorrhage, and to allay thirst and obstinate vomiting, and when introduced into the rectum it exerts some antipyretic effect.

Vapour is often used as a soothing and relaxing application in tonsillitis, bronchitis, croup, &c., and, in form of bath, to cause diaphoresis.

Constitutional Action.

When water is taken internally it acts in some measure as a purgative by supplying moisture to the fæces; it promotes digestion by stimulating the secretion of gastric juice, and aiding the passage of peptones into the blood; and it is in

some measure a diuretic, increasing temporarily the excretion of chloride of sodium, and more permanently the elimination of urea, phosphoric and sulphuric acids by the urine. It is, of course, the universal solvent, and its importance in the animal economy is shown by the fact that it constitutes about sixty-eight of the hundred parts which build up our entire bodily frame, and that five pints are given out from the body of one average-sized adult in the twenty-four hours. The urgent necessity for its purity is further proved by the leading part it has always taken in the spread of epidemics: for not only cholera, but enteric fever, has thus been largely propagated, whilst entozoa are thus introduced into the system, and the presence of other impurities may give rise to dysentery, diarrhœa, goître, and yellow fever. Specific adulterations also, like lead, have frequently occasioned very painful and even fatal attacks of illness.

But we derive great benefit in practice from the impurity of mineral waters, deeply impregnated, as they are, with various mineral ingredients, and which are met with in such profusion and variety both at home and abroad. Fashion, no less than the undoubted success attending their use, has recently brought these naturally adulterated waters prominently forward, and it is very essential that every practitioner should have some knowledge of their chief constituents and the principal health resorts where they can be partaken of in greatest perfection. Our present limits, however, will only permit a very bare enumeration of the principal classes into which mineral waters have been divided.

1st. We have the chalybeate, or ferruginous class, which contains iron in varying proportion, in the form either of carbonate held in solution by carbonic acid gas, as at Spa, Tunbridge Wells, and Harrogate; or of sulphate, as at Brighton, Isle of Wight, &c. They are possessed of tonic properties; some are hot and some are cold, and some, as at Mont Doré, contain a minute quantity of arsenious acid; and whilst we generally find them best borne as carbonate, we must be

cautious of their use in very plethoric and full-blooded patients. They are useful in cases of anæmia, chlorosis, struma, and other conditions of debility.

2nd. Acidulous or carbonated. These are agreeable and sparkling, holding in solution carbonates of lime, soda, and magnesia. They are met with at Seltzer and Carlsbad, and are serviceable in gout and dyspepsia.

3rd. Saline, some of which are purgative by containing the sulphates of magnesia and soda, as at Cheltenham, Leamington, Friedrichshall, &c.; others, as Buxton, Bath, and Bristol, are impregnated with carbonate and sulphate of lime; others with chlorides, as Wiesbaden, Baden-Baden; a fourth class contains iodine and bromine in combination with sodium and magnesium, as at Homburg, Kissingen, Woodhall, &c.; whilst a fifth class, as at Vichy, Ems, Hunyadi Janos, and Apollinaris, owe their properties to the alkaline carbonates which they contain.

4th. Sulphuretted or hepatic waters contain sulphuretted hydrogen in solution, and possess a very offensive taste and smell. They are chiefly met with at Harrogate, Moffat, Cheltenham, Aix-la-Chapelle, &c., and are principally used in chronic skin diseases, in chronic rheumatism, and bronchitis, in advanced syphilis, and for the elimination of mercury from the system. Those patients who are unable to visit the different spas at home or abroad may drink the bottled waters, or we may manufacture rough imitations by combination of the various ingredients. In prescribing saline purgatives we should always remember the principle of very free dilution and frequently repeated dose on an empty stomach; but although we may often do much good by this mode of administration, we miss the change of air and scene, the early and regular hours, the simple diet, and the special faith and mental anticipation with which the chronic rheumatic and dyspeptic sufferers approach the health resort of their choice.

CHARCOAL.

Local Action.

Physiological.

Charcoal has no purely local action on any tissue with which it is brought in contact, and as it is quite insoluble it can exert no general influence on the functions of the body. It is therefore simply a mechanical agent, and acts in virtue of the following properties :—

1. It not only freely absorbs gases within its pores, but oxidises and destroys those of an offensive and injurious nature, as sulphuretted hydrogen ; and further, it also deodorises by oxidation, and destroys organic impurities of all kinds, decolorising solutions which contain them. It is extremely doubtful, however, in how far the explanation usually given of the therapeutical action of charcoal is satisfactory. We know that moisture destroys its absorptive powers, and the dose given must be too small to exert any real influence over gases con-

Therapeutical.

In virtue of its absorbing powers, charcoal is used in many of those cases of dyspepsia where large quantities of gas are formed by premature decomposition of the food, and where much pain, nausea, and want of appetite are experienced by the patient, some cases of diarrhœa being also benefited by its use. My own experience of its use, however, hardly bears out the enthusiastic praises of some of its supporters, and I cannot but look upon it as an overrated remedy. In consumption and many chronic stomach disorders charcoal acts well by relieving the flatulence which is often the chief discomfort of the sufferer. Charcoal is also an excellent deodoriser and antiseptic, and is used for these purposes in the construction of filters, contact for four months being sufficient to purify the foulest and most deeply stained waters ; and if

tained in the stomach or intestines. More probably it acts mechanically, by the small insoluble particles stimulating the mucous membrane and causing its vessels to contract. (Brunton.)

2. Animal charcoal possesses the power of rendering various vegetable poisons inert by placing them in a form of combination beyond the absorptive powers of the stomach.

the organic matter present does not exceed from 1 to 2 grains per gallon the charcoal will permanently retain its cleansing properties. It may also be of great service in absorbing and destroying offensive effluvia in the neighbourhood of sewers or drains, and it used to be a fashionable application to unhealthy ulcers; but cleaner and equally effectual antiseptics have now entirely displaced it from popular favour.

It is also occasionally employed in the formation of respirators and as an adjunct to tooth powders.

2. If we are called very early to a case of poisoning by opium, aconite, strychnia, or other vegetable poison, we may hope to do some good by charcoal, provided that absorption of the poisonous agent has not yet taken place to any extent.

Mode of Administration.

As a medicinal agent vegetable charcoal alone is used, and may be given in doses of from a tea- to a table-spoonful, great care being taken to insure perfect freshness, as its absorptive powers are seriously impaired by keeping. It may be combined effectively with bismuth, or given in sandwich form between bread and butter, or moistened with spirit in a wine-

glass before suspension by water ; but in any case its unsightly appearance, gritty consistence, and insolubility interfere with its prescription in elegant form, and we may advise our patients with advantage to make use of the biscuits, lozenges, or capsules which the ingenuity of chemists has devised.

As an antidote, animal charcoal must be given in considerable doses, as it is calculated that half an ounce is required to neutralise one grain of vegetable alkaloid. As an antiseptic it may be placed in shallow pans close to the outlet of drain or sewer ventilating shafts.

SULPHUR.

External Use.

Sulphur is used externally as a stimulant in various forms of chronic skin disease, such as acne faciei, prurigo, and more especially in itch, a disease dependent on the presence of a minute insect—the acarus scabiei—the male of which ranges freely over the skin, whilst the female retires with her eggs to oblique burrows in the cuticle. These receptacles having been broken up by soap and water, sulphur ointment is carefully spread over all the patient's body at bed-time, and washed away by a warm bath next morning. Two or three applications of this sort are sufficient to cure the disease, and if the patient's skin will bear the lotio sulphuris one smearing with this may be sufficient. The *rationale* of the treatment is, that sulphur not only acts as a direct poison to the acarus, but that it forms with lard a very tenacious and adhesive substance which suffocates the insect by blocking up its air-pores.

Sulphur is also in great favour as a popular remedy for rheumatism, sprinkled on new flannel and applied to the painful part, and there is no doubt that some beneficial action may thus be caused. Lastly, sulphur makes a useful bath in some forms of chronic skin disease.

Internal Use.

Physiological Action.	*Therapeutical Action.*
1. It has been supposed to exert a stimulating influence on the mucous membranes and skin.	1. In virtue of this, it used to be occasionally prescribed in chronic bronchitis and phthisis, and also used externally in skin diseases. To its action on the skin may be attributed its undoubted power of aiding, more especially in the form of bath, the elimination of lead and mercury from the system. Sulphur has lately been recommended as the best means of preventing mercurial salivation.
2. It causes slight increase of the peristaltic movements of the bowels.	2. It acts, therefore, as a gentle laxative, slightly softening the fæces, and from the mildness of its action it is specially useful in piles and all irritable conditions about the rectum. Its purgative action is increased by its being dissolved and formed into a sulphide by the alkali of the bile.
3. Sulphur has well-marked antiseptic properties in consequence of its destructive power over the lower forms of vegetable life.	3. Burnt in a room with closed doors and windows, it is the best way to remove the germs of infection from the air by fumigation.

Sulphur is given off from the system principally by the

bowels, but also by the milk, the sweat, and by the skin in the form of sulphuretted hydrogen, and by the urine as a sulphate.

Disadvantages and Contra-indications to its use.

Strong applications of sulphur frequently irritate the skin, and bring on troublesome eczema; so be careful not to use them too strong or too long, and to dilute the B.P. ointment at least one-half. The disadvantage of sulphur as an aperient is the offensive odour which the sulphuretted hydrogen communicates to the fæces.

Dose and Mode of Administration.

The confection is the best official purgative form, in tea or tablespoonful doses, but the B.P. contains an excellent combination of sulphur and senna called pulv. glycyrrhizæ co., in which the proportion of sulphur is one in twelve, and for external use the ointment is generally prescribed. Remember, however, that the ointments containing potash are more irritating than those of simple formation.

℞ Sulphuris ʒj.; picis liquid. ʒvj.; adip. benzoat. ℥iv. Useful in prurigo.

℞ Sulphuris ʒj.; glycerini ℥j.; aq. ros. Oss. For acne 20 or 30 grains of iodide of sulphur rubbed up with 200 grains of powdered liquorice root is a good snuff in hay asthma.

PHOSPHORUS.

(Phosphorus is not used externally.)

Physiological Action.

1. Its action on the *nervous system* is tonic and stimulant, repairing the waste

Therapeutical Action.

1. Phosphorus has therefore usually been considered a valuable agent in nervous

of tissue. It is also useful, like arsenic, in certain obstinate forms of skin disease, as psoriasis, &c.

Broadbent explains its tonic action by a change which it effects in the blood through a gradual influence on all growths in all the organs and tissues, and more especially on cell growth in the skin as it passes through it.

2. On the circulation it acts in the first place as a stimulant; the pulse rises and gains in fulness but not firmness, the face flushes, and eventually signs of peripheric capillary expansion ensue, ending in free perspiration. In large doses, however, it depresses to a dangerous degree the heart's action.

3. The temperature during the administration of phosphorus at first rises slightly, next becomes secondarily lowered by three or four

debility, where the brain is weakened by anxiety, worry, overwork, or sexual excesses, and where too great amount of phosphates is excreted by the urine; and in neuralgia, which has been shown by Anstie to depend on a feeble state of nerve tissue. After considerable experience, however, of the drug in these conditions, I am strongly of opinion that no more overrated remedy has ever been introduced into practice, that its action as a general tonic is most uncertain, and that in neuralgia it is greatly inferior to many other older and safer preparations.

2. Its depressing action on the heart is a serious drawback to its use, several fatal cases of cardiac syncope having been caused by moderate doses.

degrees in consequence of the dilatation of the superficial capillaries and resulting evaporation from the skin.

4. On the urine phosphorus exerts the following influence: Its quantity is increased, it becomes reddish, clouded with lithates, acquiring a violet smell, and, according to B. von Bauer, its proportion of urea is markedly increased.

Hæmaturia results from a poisonous dose.

5. On the intestinal secretion no effect is produced by small doses; but it has been held by good authorities that phosphorus may interfere with digestion by preventing the action of the gastric juice on albuminoid materials. In the event of a large quantity being taken, great and persistent irritation of the stomach and intestines results, causing pain, vomiting, and purging. Jaundice is also a symptom of its poisonous action, due in all probability to obstruction of the ducts, as the biliary acids may be detected in the urine. After death fatty degeneration of the liver is generally found.

6. To the skin, phosphorus

5. Much discussion has arisen respecting the remedial powers of phosphorus in leucocythæmia and pernicious anæmia; the evidence in its favour being principally derived from one successful case, and from the undoubted fact that the number of the red corpuscles is increased under its use in the anæmia of lymphadenoma. This is not, however, accompanied by any corresponding improvement in the local condition of the patient, and these seem to be precisely the cases in which the drug most suddenly and even fatally depresses the heart's action.

6. On this account, and

acts in some measure as an irritant.

Purpura may appear as a symptom of its poisonous action.

7. Its effects on the osseous tissue are remarkable, as it has the property of causing necrosis of the jaw-bone, and this used to be common in lucifer-match makers. Some interesting experiments by Wegner have recently shown a marked influence of phosphorus in promoting the formation of bone; for when given to growing animals the cancellous tissue was rapidly transformed into hard bone, and even in the case of those fully developed the medullary canal was sensibly diminished by its use. Also, in cases of artificial fracture, not only was the resulting repair more rapid, but the quantity of bone thrown out was far in excess of the usual amount.

8. *Poisonous Effects.*—These we have seen to consist of intestinal irritation and cardiac syncope, and death from exhaustion, the *post-*

also because of its stimulating the cutaneous circulation, phosphorus has been given in the eruptive fevers, such as scarlet fever, measles, &c., to develop an insufficiently developed or prematurely faded eruption.

7. The experiments of Wegner would indicate its use in rickets, but numerous trials which I have made have given only disappointing results, and shown its great inferiority to cod-liver oil.

8. Sulphate of copper has been recommended as an antidote, and also turpentine, that is to say, the crude ozonised drug, best given in the

mortem disclosing fatty and parenchymatous degeneration of liver, muscles, and tissues generally. The blood becomes black, unduly liquid, and loaded with the products of tissue decomposition, such as uric acid, creatine, leucine, tyrosine, &c., this resulting from the ozonising properties of the poison. The degenerative changes are probably due to the formation of fat from the albuminous constituents of the tissues themselves, by increased tissue change, or diminished oxidation. $1\frac{1}{2}$ gr. has proved fatal.

form of gelatine capsules, and promptly administered, as it completely fails after twenty-four hours, about ʒij. neutralising each grain of phosphorus.

Phosphorus is given out from the system principally by the urine, the drug being oxidised in the system and eliminated as phosphates.

Contra-indications and Disadvantages.

We must generally feel our way in prescribing phosphorus, and begin with small doses, for some persons are more susceptible than others to its over-action. Sickness and diarrhœa occasionally follow its use, and Anstie records a case in which three or four $\frac{1}{30}$gr. doses gave rise to long-continued epigastric pain. Nor must we forget its tendency to cause fatty degeneration of internal organs, this result being due to the formation of fat from their albuminous constituents by increased tissue change and diminished oxidation. On the whole, we may sum up by saying that after ample trial phosphorus has entirely disappointed the hopes of those who argued from its physiological actions to its therapeutical use, and that its draw-

backs so largely counterbalance its advantages that it will probably soon disappear from ordinary practice.

Mode of Administration and Dose.

Much of our success, however, in giving phosphorus depends on the mode in which it is prescribed, and, as a general rule, capsules containing $\frac{1}{30}$ grain are found to be a convenient medium. It also goes well with cod-liver oil; but it is very difficult indeed to devise any liquid formula by which it is prevented from becoming rapidly inert by oxidation. Most of the pill masses are useless, from being made with insoluble materials which pass through the bowels unchanged. But Mr. Carteighe has furnished me with the following formula for soluble pills:—

℞ Phosphori gr. j.; carbon. bisulph. q. s.; sapon. duri, pulv. glycyrrhizæ, pulv. guaiaci, āā ʒss. Fiant pil. xxx.; and varnish to prevent oxidation.

The dose, speaking generally, is from $\frac{1}{50}$ to $\frac{1}{30}$ grain; or we may give the phosphide of zinc, a very convenient and reliable preparation, from $\frac{1}{12}$ to $\frac{1}{4}$ grain.

IODINE.

Local Action.

Physiological.

Iodine in substance is never used save for its antiseptic properties. Dissolved in spirit, however, it is an excellent counter-irritant, producing itching and smarting of the skin, with desquamation of cuticle, and even blistering if the application be too frequent.

Therapeutical.

It is therefore of some value for the correction of fœtor in drains, &c.

The tincture or liniment of iodine is very extensively used as a counter-irritant application to enlarged glands, chronic abscesses, swollen joints, chilblains, and to

quently repeated. It has been shown that this local action of iodine is attended by a very free extrusion of colourless blood corpuscles into the subcutaneous cellular tissue.

Experiment has proved that iodine is not absorbed into the system through the unbroken cuticle of adults. M. Jules Simon, however, tells us that the application to the skin of children of equal parts of tinct. of iodine and glycerine will cause on the following day the appearance of iodine and albumen in the urine.

Inconvenient results have occasionally followed its absorption after injection into ovarian cysts.

various forms of skin disease, more especially the common varieties of ringworm, which speedily yield to this treatment. It is very useful when painted over the chest in chronic pneumonia and fibroid and tubercular affections of the lungs; and Mr. Jordan, of Birmingham, has drawn attention to the great success attained by him in the dispersion of boils, carbuncles, and suppurating glands by iodine freely applied to a neighbouring vascular area.

It is also an excellent injection into various secreting cavities, curing hydrocele by obliterating the sac of the tunica vaginalis, acting well on the same principle in some rare cases of ovarian dropsy and bronchocele, and deodorising and lessening discharges in empyema and suppurating glands. Pledgets of iodised wool for the vagina will be found useful.

Constitutional Action.

Physiological.

1. *On Brain and Nervous System.*—No special action on the nervous system has been

Therapeutical.

1. Iodide of potassium is of great service in many brain diseases, and most especially

observed, unless we hold that the uncomfortable sensations of misery and depression occasionally following the use of pot. iod. may be thus explained, and patients occasionally complain of weariness and muscular debility, due, no doubt, to the action of the potassium on the spinal cord.

2. The effects of iodine on the *circulation* have never been properly estimated, but some observers say that it tends to contract the vessels and cause increased rapidity of the heart's action. Pot. iod. has very swift diffusive power, entering the blood very rapidly and being given off within ten minutes after ingestion.

3. On *respiration* and *temperature* no effects have been noted.

4. Effects on *secretion*.

i. *Intestinal*.—Nothing special save occasional loss of appetite and disordered digestion.

ii. *Urinary*.—Pot. iod. has some diuretic action, more especially in connection with other drugs.

iii. The salivary secretion is

those in connection with tertiary syphilis, where gummata and other forms of tumour cause those excruciating pains and varying nervous phenomena which have been so ably described by Drs. Broadbent and Buzzard.

2. Pot. iod. has been used with great benefit by Dr. Balfour and others in aortic aneurysm, several successful cases having been reported. It is difficult to explain the *rationale* of its action, but it is essential that large doses (twenty grains) be prescribed and continued regularly for a year or more.

ii. Pot. iod. is occasionally used to heighten the diuretic action of other drugs.

often markedly increased, true salivation being sometimes produced.

iv. It is also believed that pot. iod. has some special action on glandular tissues in general, increasing their absorptive powers, and even exciting them to absorb themselves; and in support of this last proposition it has been stated that, under its use, the mammæ and testicles have been observed to waste and disappear. This conclusion has evidently been arrived at, however, by confusing the *post* with the *propter hoc*, and it is probable that the remedy does not so much actually stimulate the absorbents as reduce effused lymph to a condition more favourable for elimination.

5. It also has the power of removing various metallic substances from the tissues, mercury and lead, for instance, being occasionally deposited in the form of an insoluble albuminate, and released from this condition by the action of the drug.

iv. Pot. iod. is often given to facilitate and hasten the absorption of the products of inflammation in the later stages of pleurisy, pneumonia, pericarditis, &c.

It is probable that in presence of the ozone and acids of the blood free iodine is set free, which then acts on those albuminoid substances for which it has an affinity.

5. In chronic lead-poisoning, so often met in house-painters, and to remove mercury from the system, we generally prescribe pot. iod., and in the latter case we must not be surprised if our patient is suddenly seized with profuse salivation. This

6. Finally pot. iod. has an irritating action on mucous membranes, causing redness, tingling, and free secretion, much resembling an ordinary catarrh, and also thinning and liquefying tenacious pathological mucoid secretions.

7. There are other important uses of pot. iod. which cannot be arranged under the preceding categories, and which must therefore, if we admit the use of such a word, be called specific. These are its influence over syphilis, gout, chronic rheumatism, and simple periostitis.

In the somewhat mysterious language of old-fashioned therapeutics, potassic iodide has also been known as an 'alterative.'

is explained by the released mercury finding its way back into the circulation, and exerting its usual influence on the salivary glands.

6. Pot. iod. is often prescribed in cases of bronchitis where the expectoration is thick, tenacious, and difficult of expulsion, and it here acts well by thinning the sputa.

7. In cases of tertiary syphilis pot. iod. often acts like a charm. In the primary and secondary forms it is of little or no use, but when the deeper tissues begin to be affected, and when we meet with deep rupial or other ulcerations of the skin, ulcers in the throat, periostitis, and head symptoms, we may then prescribe iodine with the certain expectation of relief. In chronic gout it is also of service, and in chronic rheumatism, more especially in those cases where we meet with tenderness to pressure and nocturnal increase of pain. In simple periostitis of the head, sternum, or tibia, which often results from exposure to cold, pot. iod. has

an almost magical effect, and will often bring about a cure after two or three days' treatment.

Pot. iod. is eliminated from the body by the urine, saliva, tears, milk, &c.; it is rapidly absorbed, experiment having shown that water containing a minute quantity of the salt has its diffusive power greatly increased. It can be detected in the urine in ten minutes after being swallowed, and is rapidly given out, so that the whole may be recovered from the various secretions.

Disadvantages and Contra-indications.

As regards its disadvantages and contra-indications we must remember the possible occurrence of iodism, to which unpleasant symptoms some persons are much more susceptible than others. These consist, in the first place, of irritation about the mucous membranes, running at the eyes and nose, sneezing, frontal headache, swelling of the eyes, and salivation; an eruption not unlike nettle rash is sometimes observed; occasionally acne may be the result, and Ringer has described a peculiar petechial eruption affecting the legs. Quite recently Mr. J. Hutchinson has expressed his belief that the formidable pustular eruption known as hydroa is really caused by iodide of potassium; but in my own experience and that of others who have freely prescribed the drug, these various uncomfortable effects are comparatively seldom observed, a curious point being that iodism seems to be much more readily excited by small than by large doses of the drug.

In some persons a good deal of depression and digestive derangement is caused, with nausea, diarrhœa, and debility, and troublesome pains in the joints. It is badly borne in exophthalmic goître, causing rapid emaciation.

A variety of eruptions have been described, all of which are more likely to occur in patients suffering from kidney disease:—

1. A rash resembling urticaria has been observed.

2. An eruption which probably, according to its various stages, may be vesicular, papular, or pustular, closely resembling acne, or a more formidable condition of things may arise from its development into bullæ, which occasionally bursting may form fungoid masses, varying in size from a pea to a shilling. This is held to differ from hydroa, which Mr. Hutchinson tells us is almost invariably due to iodide of potassium.

3. Small round miliary discrete petechial spots on the front of the leg, below the knee, occurring from two to six days after the moderate use of the drug.

4. A general eruption of purpura. Dr. Stephen Mackenzie records a fatal case in a child of five months, following a single $2\frac{1}{2}$-grain dose.

5. A tendency to erysipelas has been noted in patients taking potassic iodide.

It is fortunate for the credit of one of our most useful drugs that these eruptions are rarely observed, the most common being a few acneiform pustules on the face, which careful microscopic observations have proved to be quite unconnected with the sweat glands, but to depend on plugging of the small vessels with coagula, followed by rupture and extrusion of their contents.

Antidote.

Some few years ago Sir James Paget observed that the addition of sp. am. aromat. to pot. iod. not only lessened the chances of iodism, but enabled us to limit ourselves to a smaller dose, and this has come very generally into use. Seguin tells us that we can usually avoid iodism if we give pot. iod. in free dilution on an empty stomach, about half an hour before a meal. He points out that, if given on a full

stomach, the acid reaction of the half-digested food splits up the salt and liberates free iodine.

Dose and Mode of Administration.

Tinct. iodi 5 to 20 minims, but this is seldom prescribed.

Pot. iod. as anti-syphilitic, from 3 to 30 grains, or even 60, according to the judgment of prescribers, it being necessary in obstinate cases to push the drug very freely.

Professor Syme, however, used to say that all good effects can be obtained by two or three grains, and in ordinary cases of syphilis or periostitis, rheumatism, &c., this will be found a sufficient dose, copious dilution aiding its effects.

In aneurysm we must give at least 20 grains, and in advanced syphilitic affections even larger doses are well borne.

℞ Potassii iodidi gr. xxxx. ; spiritûs ammoniæ aromatici ℥ss. ; syrupi aurantii ℥j. ; decocti sarsæ compositi ad ℥viij. Capiat unciam unam ter in die.

Coster's paste or iodine dissolved in colourless oil of tar is a useful application in ringworm.

℞ Iodinii ʒij.
Ol. picis liq. ad ℥j. M.
(The colourless oil of tar.)

It is sometimes convenient to decolorise iodine, and this may be done by carbolic acid, or by adding 40 minims of a saturated solution of hyposulphite of sodium to each ounce of the tincture.

Lin. pot. iod. c. sapone P. B. is an excellent preparation, very useful in chronic rheumatism and enlargement of the joints.

Sodii Iodidum, the properties of which are much similar to those of iodide of potassium, is now official.

Dose, 5 to 10 grains.

IODOFORM.

Iodoform is not much used internally, on account of its disagreeable taste and tendency to produce iodism.

Experiments on animals have shown that it produces fatty degeneration of the heart, liver, and kidneys, and death with symptoms of general paralysis.

It is, however, an excellent local application, being anæsthetic in its properties, although its first application causes smarting.

When applied to the surface of the body, dissolved in collodion, it reduces the temperature.

It is an admirable application to venereal sores, chronic ulceration of every kind, including diphtheria and cancer, rupial sores, bubos, and indolent sinuses, throat ulcerations, ozæna, subacute eczema, and post-nasal catarrh, catarrhal inflammation of the tympanum and Eustachian tube, and purulent conjunctivitis.

It may be used in powder, as an ointment with vaseline (1 to 4), the odour being concealed by some aromatic oil, and especially balsam of Peru and musk, dissolved in chloroform, which is its best solvent, or as iodoformed wool.

℞ Iodoformi gr. j.; bals. Peruv. gr. ij.; vaselini gr. viij. Fiat ung.

The Pharmacopœial preparations of iodoform are suppositoria iodoformi, each containing three grains, and unguentum iodoformi. If any one should wish to use it internally—which is not very likely—the dose is ½ to 3 grains.

BROMINE

has been used as a caustic in gynæcological practice.

Bromine in a free state being never used in medicine, we shall consider its properties under Bromide of Potassium.

POTASSII BROMIDUM.

(Bromide of Potassium is not used externally.)

Physiological Action.

1. *On Nervous Function.*—Long continuance in the use of pot. bromid. tends to cause a sense of fatigue and general muscular prostration, with giddiness and staggering.

Brain.—The functions of the brain are lessened, and sleep results, depending, like the normal physiological process, on an anæmic condition of the brain.

Spinal Cord.—Experiment has shown that it lessens, and finally abolishes the reflex functions of the spinal cord; voluntary movement, which is at first unimpaired, finally becoming paralysed. This is probably due to the potash, as potassium iodide and chloride cause much the same symptoms, which are never observed after the administration of the bromide of sodium.

Potassium bromide undoubtedly lessens the irritability of sensory nerves.

It has also been observed

Therapeutical Action.

1. Pot. bromid. has gained great repute within the last few years in the treatment of a large series of convulsive and spasmodic affections. and most especially in epilepsy, it being now thoroughly established that if we get our case sufficiently early we may absolutely cure it, and even if it is too confirmed for this result we may keep it in check. The cases most under the influence of the drug are those known as the *haut mal*, where violent struggling is followed by comatose sleep; on the other hand, in the *petit mal*, where the attack is indicated merely by passing unconsciousness, or when the seizures occur principally at night, the remedy will frequently disappoint us.

When the remedy is acting well we will always readily detect a decided suppression of reflex sensibility at the back of the tongue and fauces, free contact with a brush or

that the power of voluntary movement persists for some time after the abolition of reflex function, proving that the influence of the drug is exerted probably either upon the afferent nerves or upon those portions of the cord which transmit the impulse from these nerves to the cells presiding immediately over motion.

Sympathetic System.—Pot. bromid. is supposed to have a sedative influence over the sympathetic system of nerves; but on this point the evidence is very contradictory.

2. *Effects on Circulation.*—No special action on the heart has been observed save some slight lowering of its spatula causing no feeling of nausea.

Pot. bromid. is believed to act in epilepsy by relieving the spasmodic contraction of a vessel supplying a special vascular brain area which is thus deranged in function.

It is also of great benefit in the various convulsive seizures of children, in laryngismus stridulus, night terrors, and also in those spasmodic symptoms which depend on meningitis or organic brain disease.

It is of service in incontinence of urine, pertussis, cramp of lower limbs, chorea, in delirium tremens, and in many of those forms of mental depression, nervous headache, and vague sensations indicating nervous disturbance, which are so distressing to some women about the change of life.

It is said to be a good remedy in sea-sickness from the sedative effect on the centre concerned in the reflex act of vomiting.

2. Bromide of potassium is an excellent narcotic, and causes refreshing sleep, more especially in cases of worry,

action. The smaller arteries have been said to be contracted, the pulse becoming smaller, and we may thus explain the hypnotic action of the drug, the brain being rendered anæmic as in physiological sleep.

3. Its influence on *digestion* is not marked; for although it sometimes seems to lessen the appetite, this is not a constant result.

4. The effects on the *urinary secretion* have not been thoroughly made out.

5. Bromide of potassium has an undoubted influence over the generative organs, lowering their excitability, and even in large doses suspending their action.

mental anxiety, or overwork, a full dose being given at bedtime; and in acute mania its use in combination with chloral is highly praised by Clouston.

It is said to heighten the action of opium, and lessen the nausea, giddiness, and faintness occasionally following the use of that drug.

3. Its sedative influence over reflex function has suggested its use in some forms of dyspepsia, and this seems to have been successful.

4. It has been much praised by Begbie in diabetes.

5. It is useful in priapism and in those forms of menorrhagia which depend on ovarian irritability, and it has been used with success in the acute stages of gonorrhœa, and in spasmodic stricture.

Pot. bromid. is eliminated from the system by the urine, breath, sweat, milk, a case being recorded in which the child of a suckling mother taking pot. bromid. became covered with acne.

Disadvantages and Contra-indications.

We have already noted the peculiar nervous symptoms occasionally caused by pot. bromid.—giddiness, general muscular fatigue, even amounting to actual staggering in some

cases. But in addition to this an unpleasant eruption of acne often breaks out on the face, and may arise from a very small dose. If the remedy is persisted in, in spite of this, the whole body may eventually be covered with large unsightly blotches. Bromide acne may in some measure be prevented by adding a little liquor arsenicalis to each dose, and may be removed by the following lotion :—

℞ Sulph. præcipitat. ʒiij. ; spir. camph. ʒj. ; aq. calcis ad ℥iij.

Dose and Mode of Administration.

The dose for epilepsy ranges from 10 to 60 grains, it being necessary to increase the quantity gradually, and continue its use for long periods, even years, occasionally leaving it off for a week or so, after which it seems to gain some of its lost effect.

As a hypnotic gr. xx. ad xxx. In other cases about gr. xx. as an average. Children appear to be very susceptible to its use, acne being readily produced in them by moderate doses. As its taste is rather nauseous, we must disguise it thus :—

℞ Potassii bromidi gr. xxx. ; syrupi aurantii ʒj. ; aquæ floris aurantii ad ℥ij. Fiat haustus horâ somni sumendus.

℞ Potassii bromidi ʒiij. ; morphinæ acetatis gr. x. ; glycerini ℥ij. ; chloroformi ʒiij. Recommended by Schrötter as an efficient means for lessening the sensibility of the fauces and larynx previous to operation. Frequent application should be made by brush.

Sodii bromidum acts much in the same way as potassii bromidum. Dose, gr. x. ad gr. xxx.

CHLORINE.

The use of chlorine is almost entirely confined to its external application.

Physiological Action.	*Therapeutical Action.*
1. Concentrated chlorine gas directed upon the skin causes redness and smarting, followed by a pustular eruption and even erysipelatous inflammation.	1. It is never, however, used as a counter-irritant.
2. It is an excellent disinfectant, decomposing sulphuretted hydrogen and ammonium sulphide at once and more effectually than any other gas, and also destroys organic matter in the air, as it bleaches organic pigments and destroys odours, either by abstracting hydrogen or by oxidation.	2. It is therefore extensively used as given off by chloride of lime to purify the air from offensive effluvia and to destroy infectious germs. In the form of lotion of chlorinated soda it is also used to cleanse foul or sloughing sores.
3. The inhalation of chlorine gas is stimulating or irritating to the lungs.	3. It has therefore been used in some forms of chronic bronchitis and phthisis, but is not now much employed.

Internal Use.

Chlorine used to be given internally in medicine in various infectious fevers with a view to disinfection, but this has now become quite obsolete.

Dose and Mode of Administration.

As a disinfectant it may be obtained by acting on chloride of lime with water or dilute sulphuric acid, or by pouring four parts by weight of strong hydrochloric acid on one part of powdered binoxide of manganese, or mixing four parts of common salt and one of binoxide of manganese with two parts by weight of sulphuric acid and two of water, varying the quantities according to the size of the room.

Vapor chlori is used for inhalation, and liquor chlori may be employed diluted as a lotion, or ℥x. to ℥xxx. be given internally.

Disadvantage.

The great drawback of chlorine is the very irritating nature of its vapour, rendering it unsuitable for general use in rooms actually inhabited by the sick.

CHRYSAROBINUM.

Chrysophanic Acid.

Chrysophanic acid has recently come into very general use as an external application in cases of psoriasis and ringworm.

There is no doubt, as I have amply verified by my own experience, that, although not the infallible specific it originally seemed to be, this is a very useful remedy in psoriasis and the various forms of tinea. Its drawbacks are :—

1. The irritation it often excites. This may either be in the form of a papular eruption, or of an inflammatory condition closely allied to erysipelas, frequently spreading over the head and face, and attended with most distressing smarting and tingling.

2. The peculiar purplish discoloration of the skin which it causes, and which is only removed by the desquamation of the cuticle which usually follows.

3. The way in which it stains linen—the discolorations, however, being removed by the use of bleaching powder.

DISINFECTANTS AND ANTISEPTICS.

Disinfectants are 'agents capable of so modifying the contagium of a communicable disease, during its transit from a sick to a healthy individual, as to deprive it of its specific power of infecting the latter' (Baxter).

Among them are chlorine, iodine, charcoal, sulphate of iron, permanganate of potassium, &c. &c.

Antiseptics have the power of destroying septic germs, the principal being carbolic acid, creasote, sulphurous acid, chloride of sodium, corrosive sublimate, chloride of zinc, &c. &c.

ACIDS.

We next come to the consideration of acids, and, before enumerating the therapeutic properties of each individual member of the group, it will save time and repetition if we draw attention to the collective actions and uses of acids in general.

External Action.

Physiological.

Acids, being possessed of high diffusive power, rapidly permeate tissues to which they may be applied, coagulate their albumen, and if concentrated absorb their watery constituents and cause their destruction.

Therapeutical.

Acids, if used in concentrated form, therefore act as *caustics*, eating away and destroying animal tissues. When more diluted they are *astringents*, hardening and constringing weakened parts, and checking unhealthy secretions.

Internal Action.

1. All the acids, however, have the property of increasing

1. The action of acids in checking hæmorrhage is thus

the acidity of the blood, probably rather by setting free another acid than by a direct action on that fluid; for by the time they enter the circulation they are themselves converted in great measure into salts by the various alkaline secretions with which they have come in contact.

2. They may also contract the smaller blood-vessels by reflex action, or by directly astringing them locally.

3. Their action on *secretion* is interesting, and has been specially pointed out by Ringer. It appears that an acid applied to the orifice of a gland secreting an acid fluid will check that secretion, and thus any member of this group taken into the stomach before or at the beginning of the process of digestion will tend to act unfavourably by stopping the flow of gastric juice.

explained, as there is no doubt that coagulation is encouraged by an acid condition of the blood.

2. They are useful in internal hæmorrhage and to check excessive perspiration.

3. This physiological action points to a valuable bearing on therapeutics. Some cases of dyspepsia depend on a deficient production of gastric juice, enough of this fluid not being secreted under the stimulus of food to dissolve and digest the albuminous constituents. This condition may be mechanically remedied by supplying a little acid given some time after food. But again, still more cases of disordered digestion are caused by an excessive formation of gastric juice, the surplus supply of acid teasing and worrying the mucous membrane of the stomach, and causing pain, sour eructations, and general distress. Here

But if acids arrest secretions having their own chemical reaction, they stimulate those which are alkaline, markedly increasing their quantity. Thus we find that they tend to promote the flow of the saliva, of the bile, and of the pancreatic secretion.

our physiological law comes into play, and we check the over-secretion by giving the acid immediately before the meal. Or again, discomfort may result from irregular or excessive fermentation of food, giving rise to the formation of a large quantity of acetic, butyric, and lactic acids ; and this undue fermentation is found to be itself directly controlled by acids given in this case after food. Possibly some of their influence in checking acid perspiration may be due to this law.

We can thus explain what has been called the refrigerant action of acids, or their undoubted influence in relieving thirst and imparting a fictitious sensation of coolness. By stimulating the secretion of the salivary glands we moisten the dry, parched mouth of our fever patient, and quench his thirst perhaps better than in any other way.

It is probable also that some at least of the beneficial influence exerted by acids on chronic biliary derangement is due to their directly increasing the flow of alkaline fluid from the liver.

On the Urine.—Acids increase somewhat the acidity of the normal urine, but have no power of rendering an alkaline urine acid. This property is alone possessed by benzoic and citric acids.

4. Acids, by their astringent properties, brace up relaxed mucous membranes and check unhealthy secretions.

4. They are therefore good tonics, and act well in diarrhœa and profuse sweating.

Disadvantages.

The prolonged use of acids is apt to exercise a very unfavourable influence on digestion, rendering persons pale and languid, and causing a great deal of emaciation; and this was no doubt the secret of the action of vinegar in reducing corpulence, which used to be so highly prized in the Byronic days, and by incautious indulgence in which so many ignorant people have at various times ruined their health.

Poisonous Effects.

The symptoms consist of very violent burning pain in the stomach and intestines, vomiting, purging, intense prostration, and death either by shock or by the results of secondary inflammation. On *post-mortem* examination, intense inflammation of the stomach and intestines is found, with ulceration of the mucous membrane, and even perforation into the peritoneal cavity; and if the case is of a more lingering character, fatty degeneration of various internal organs, but more especially the kidneys, becomes gradually developed.

We will now proceed to consider the various acids in succession, and will do so by briefly referring to their individual peculiarities. It will not be necessary to place most of them in the diagrammatic form, as the principle of the action of this class of substances in general has already been sufficiently dwelt upon.

ACETIC ACID.

External Action.

Strong or glacial acetic acid is a favourite and very successful application to warty growths, whether of venereal origin or not. The little tumour is touched several times with a glass rod or brush or a piece of wood dipped in the acid, care being taken that none of the fluid trickles down over the neighbouring structures. A few repetitions of this process will generally prove effectual. It is also topically used in some obstinate form of skin disease, and more especially the varieties of tinea comprised under the term ringworm. The acid probably acts by directly attacking and destroying the parasitic growth on which these troublesome affections depend. Acetic acid is also occasionally applied to corns.

Internal Use.

Acetic acid is seldom used internally, although it forms an agreeable and effectual remedy for the checking of night sweats, and Graves used thus to prescribe it.

The varieties of acetic acid are: Acidum aceticum, from which are prepared acidum aceticum dilutum and oxymel, the doses being of acid. acet. dil. ʒj. to ʒij., oxymel ʒj. to ʒij.; and acidum aceticum glaciale. Then we have vinegar, the strength of which corresponds pretty accurately with the dilute acid, and which is purely a domestic remedy for headache, hysteria, and other allied conditions.

ACIDUM BORICUM (BORACIC ACID).

This is an excellent antiseptic application to superficial granulating surfaces, used as a lotion, 40 per cent. saturating water, or as boracic lint made by soaking lint in a hot 30 per cent. solution, and allowing it to dry, or as an *Ointment*.

Dr. Thin, finding that fœtid sweating of the feet depends on the secretion of a fluid which rapidly swarms with a

specific form of bacterium, advises the stocking feet to be soaked for some hours daily in a saturated solution of boracic acid. Change the stockings twice daily and use cork soles.

A good application in ringworm is :—℞ Acidi borici ʒiv. ; ætheris ʒv. ; spiritûs vini rectificati ʒxx. Fiat solutio saturata limpida.

ACIDUM CHROMICUM.

Liquor acidi chromici P.B. Chromic acid has been used as a caustic application for cancerous and other sores.

ACIDUM CITRICUM.

External Use.

Citric acid was proposed a few years ago as a soothing local application to cancerous sores, but of this little has recently been heard.

Internal Use.

Citric acid is used chiefly as a cheap and convenient substitute for lemon juice in effervescing draughts, which are very extensively prescribed on account of their cooling and refreshing properties in feverish conditions, and for the soothing influence of their carbonic acid when the stomach is irritable.

Whenever lemon juice can be procured, it should be used in preference ; but at periods of the year when this fruit is out of season citric acid will act well ; and we here give a table from Squire, showing the proportions in which the acid and alkali should be prescribed to ensure exact saturation :—

17 grs. of citric acid, or half a fluid ounce of fresh lemon juice	neutralise	25 grs. bicarbonate of potassium.
		20 ,, carbonate of potassium.
		20 ,, bicarbonate of sodium.
		35 ,, carbonate of sodium.
		15 ,, carbonate of ammonium.
		13 ,, carbonate of magnesium.

Acidum tartaricum, being cheaper than citric acid, is often used to construct effervescing draughts.

Dose.—20 to 30 grs.

ACIDUM HYDROBROMICUM DILUTUM.

This is an excellent addition to a quinine mixture, because it not only dissolves the alkaloid, but prevents in some degree the unpleasant deafness and ringing in the ears which often follow its administration.

Dose.—ɱxv. to ʒij.

ACIDUM HYDROCHLORICUM.

External Use.

Hydrochloric acid is a good form of application to diphtheria when it is used combined with equal parts of honey.

Internal Use.

Of all the acids used in medicine this has undoubtedly the most beneficial action in dyspepsia, on account probably of its forming one of the normal constituents of the gastric juice. In cases where we suspect the formation of an excessive quantity of this fluid, we may, on the principles already enunciated, limit its secretion by prescribing the acid immediately before meals. When the epigastric pain comes on immediately after eating, the condition is no doubt due to an irritable or perhaps ulcerated condition of the stomach itself, and we may best hope for success by carefully regulated diet and the use of bismuth, soda, or hydrocyanic acid. But when the pain does not set in with severity until from an hour to a couple of hours after food has been swallowed, the explanation probably is that an abnormal excess of gastric juice has been secreted, and a recurrence of this will best be checked by giving a little of the acid before meals.

Hydrochloric acid has also been much recommended by

Dr. Chambers and others in typhoid fever, and it will generally be found that 20-minim doses of the dilute acid are very grateful to the patient, as quenching the thirst and moistening the tongue.

Dose.

In dyspepsia ♏xx. ad xxx., in typhoid fever ♏xx. of the dilute acid every two hours.

℞ Acidi hydrochlorici dil. ♏xx.; sp. chloroformi ♏xv.; infusi gentianæ co. ℥j. Ter in die. In dyspepsia.

Acidum lacticum and *acidum lacticum dilutum* are recent additions to the Pharmacopœia, but I am not aware of their being medicinally used.

Acidum meconicum has been added to the British Pharmacopœia for the purpose of making a very useful preparation, the bimeconate of morphine.

ACIDUM NITRICUM.

External Use.

Nitric acid is undoubtedly the best form of local application in all forms of sloughing or phagedænic ulceration, whether of venereal origin or otherwise. In these rapidly destructive forms of disease we should place our patient under the influence of an anæsthetic, and then apply the strong acid freely and thoroughly to all parts of the affected surface, and we shall thus often succeed in arresting a process which would otherwise go on to severe and even fatal disorganisation.

It is also used locally in the treatment of piles, more especially those flat irritable forms of tumour which do not come readily within the reach of the clamp or ligature.

In the proportion of 10 or 20 minims to an ounce, nitric acid forms a good astringent lotion in cases of indolent or unhealthy sores; and it has been recommended by Dr. Roberts, of Manchester, as an injection into the bladder for the solution of phosphatic calculi.

Internal Use.

Given internally, nitric acid has tonic properties, and, in combination with bark and opium, acts well in cases of foul or sloughing ulceration. Again, in constitutions broken down by syphilis or by chronic hepatic disease, we may very beneficially give our patient from 15 to 20 minims of the dilute acid three times a day, its action on the liver being by some supposed to have somewhat of a specific character.

℞ Acidi nitrici diluti ʒij.; tincturæ opii ɱxxxx.; tincturæ cinchonæ ʒss.; decocti cinchonæ ad ℥viij. ℥j. ter die. In a case of foul or sloughing ulcer.

We have also the Acidum Nitro-hydrochloricum, which is supposed to have some special action on the liver, and is most extensively used in chronic functional affections of that organ.

Dose.—5 to 20 minims.

℞ Acidi nitro-hydrochlorici diluti ʒij.; succi taraxaci ℥ss.; spiritûs chloroformi ʒjss.; aquæ ad ℥viij. ℥j. ter die. In a case of sluggish liver.

It has also been highly recommended, in the form of bath, in various hepatic disorders, in the proportion of 6 fluid ounces to three gallons of water.

ACIDUM OLEICUM.

This is used in the manufacture of the oleates of mercury, lead, and zinc, which are clean and handy preparations.

ACIDUM PHOSPHORICUM CONCENTRATUM.
ACIDUM PHOSPHORICUM DILUTUM.

This acid has been credited with various special therapeutical virtues, none of which have stood the test of experience; and it is now merely used as a light and agreeable tonic and astringent. We may take occasion, however, to mention

a mistake which is not uncommonly made in prescribing, and that is to prescribe phosphoric acid with the view of obtaining the medicinal influence of phosphorus. Now it is well known that only from phosphorus in a free condition do we obtain the real action of the drug, and of this phosphoric acid contains no trace.

Dose.—10 to 30 minims.

ACIDUM SALICYLICUM (SALICYLIC ACID).

Sodii Salicylas. Dose, gr. xx. to ʒj. (1·30 to 4 gm.)
Unguentum Acidi Salicylici.

Local Actions.

Physiological.

Salicylic acid is an excellent antiseptic, delaying putrefaction and preventing decomposition; but in this respect it is decidedly inferior to carbolic acid.

Maclagan, regarding acute rheumatism as of malarial origin, holds that salicylic acid acts by destroying the poison on which the disease depends, and which, if this theory be true, is probably some form of microbe.

Therapeutical.

Being less irritant than carbolic acid, it has been proposed as a substitute for that substance in carrying out Lister's antiseptic system. It has also been recommended as a good lotion to raw surfaces; but Callender has shown that it not only tends to irritate the wounds, but frequently brings out a crop of irritable vesicles in their neighbourhood, attended with marked constitutional disturbance. It has been used as an application in croup, diphtheria, and hay fever, in powder or solution. In antiseptic surgery salicylic wool and jute are of considerable service.

Constitutional Action.

Salicylic acid is an antiseptic and antipyretic, rapidly reducing temperature in feverish conditions, although in a state of health the drug seems to be without influence on the body heat. Some headache, giddiness, and ringing in the ears have been observed, but the cardiac and respiratory functions are not sensibly affected. The secretion of saliva is increased.

In poisonous doses, slowing of the breathing and convulsive attacks, from diminution of excitability of the vagus, have been observed. Nausea, burning in the throat, vomiting, and stomach irritation have occasionally been noticed to follow the use of the acid; and albuminuria with almost total suppression of urine, and occasionally hæmaturia, are more rarely noted among its effects; the most usual action, however, on the kidneys being diuretic, with slight increase of urea and uric acid. The real danger of the drug, however, consists in its depressing

Salicylic acid is now universally allowed to be a most efficient remedy in acute rheumatism, very rapidly reducing temperature, relieving pain, and, in fact, cutting short the disease. By shortening the duration of the joint inflammation, it naturally limits the tendency to cardiac complication; but it seems to have no influence over developed pericarditis or in averting or arresting conditions of hyperpyrexia. In an ordinary case of acute articular rheumatism we may count upon cutting short the disease in two or three days, the pain going first and then the fever. It is well to continue the drug for 10 or 15 days after the apparent cure, in order to prevent relapses, which are specially liable to occur, and the anæmia so often following other modes of treatment is not met with under this. It is of less service in chronic rheumatism or gout, it is useless in ague, and although in typhoid fever the temperature may go down,

influence on the heart's action, weakened as this is by a softened condition of its muscular structure.

no influence is exerted on the duration of the disease.

Mode of Elimination.

Elimination is effected by the urine beginning in 10 minutes and being completed in from 24 to 48 hours, and the acid seizing glycocol from the liver and other organs becomes converted into salicyluric acid, thus resembling the conversion of benzoic into hippuric acid. Probably a little is also given off by the sweat and saliva. The sodium salt is rapidly transformed into the original acid by the carbonic acid of the blood.

Dose and Mode of Administration.

We may give salicylic acid in 20-grain doses, repeated hourly for six hours on two successive days, and continued at shorter intervals if the disease resists 48 hours' medication. As much as 280 grains has been given without injury within 12 hours, but it is always well to avoid very large doses, which are very apt to cause irritation and discomfort.

Salicylic acid, being irritating and very insoluble, has been now almost entirely displaced by the *salicylate of sodium*, which is freely miscible with water, and is readily absorbed ; the dose being gr. xx. to ʒj., generally administered in the smaller dose every hour until a drachm has been given daily.

Dangers from Salicylic Acid.

Several instances have occurred in which this agent has unexpectedly produced disagreeable consequences. Dr. Watelet communicates a paper to a late number of the 'Bulletin de Thérapie' on this subject, in which the details are given of two cases of rheumatism treated by salicylate of sodium, one of which was followed by gangrene of the lower extremities, and

both by cystitis, obstinate constipation, and coldness of the extremities.[1]

Salicylic acid has a strong affinity for lime, and it is thought that its administration, if long continued, may injuriously affect the bones and the teeth. Whether this technical objection also exists against it when given in combination with alkalies is not clear, but in this form it is certainly safer, and these salts are now generally used in preference to the acid itself.

Since these alkaline salts have come into general use, we have heard much less of the uncomfortable effects occasionally caused by the acid, and some of which at all events were due to impure preparations containing carbolic or cresylic acid. If, however, we wish altogether to avoid these disagreeable effects, we must be very careful only to use the acid and the salt prepared from oil of wintergreen. But, in addition to the peculiarities mentioned above, careful observers have described urticaria and irritable erythematous and vesicular cutaneous affections and sore throat, with a species of quiet delirium and feverish symptoms, and we are specially warned to beware of its use in kidney disease. As a general rule, however, the sodium salt may be freely prescribed without the anticipation of these undesirable results.

Salicylic acid is very insoluble, and it is difficult to find a ready medium for its administration. Messrs. Savory and Moore have devised a very elegant granular, effervescing preparation, or we may use the salicylate of sodium or ammonium. The following are good formulæ :—

℞ Acidi salicylici . . . . . ʒj.
Olei amygdalæ expressi . . . f. ʒv.
Pulv. acaciæ . . . . . ʒijss.
Syrupi amygdalæ . . . . . f. ʒvj.
Aquæ aurantii floris . . . . ad f. ℥iij.
S. Capiat f. ʒj. pro dosi.

For children.

[1] *Dublin Press and Circular.*

Or,

℞. Acidi salicylici . . . . . 3j.
Sp. rect. . . . . f. 3ijss.
Dissolve.
Potassii citratis . . . . . f. 3j.
Syrupi aurantii . . . . . f. 3ij.
Aquæ . . . . . f. 3iijss.

Mix the two solutions and filter, and then dilute with water to taste.

ACIDUM SULPHURICUM.

External Use.

Strong sulphuric acid is the most powerful caustic of this group, rapidly charring and desiccating the tissues, from its great affinity for water. M. Velpeau, of Paris, strongly recommended its use in cancer, the acid being made into a paste with saffron and applied to the morbid growth, it being found, after detachment of the sloughs, that a clean ulcerating surface remained; and Professor Syme proposed a modification of this plan, on the score of economy, by using sawdust instead of saffron. Ricord, of Paris, also advises the application of sulphuric acid in combination with charcoal to syphilitic ulcers, holding that if this process is effectually carried out before the fourth day, we may hope to avert the evil consequences of constitutional infection.

Mr. Pollock has advised the local use of strong sulphuric acid in caries and necrosis and suppurating synovial membrane of joints, either applied on a glass rod, or injected, or brought in contact on lint with the diseased surfaces, in the proportion of one part of acid to two, three, or six parts of water; and this plan of treatment has been used with good success in St. George's Hospital (*vide* 'Lancet,' May 28, 1870, and 'Medical Times and Gazette,' December 11, 1875).

Internal Use.

Diluted sulphuric acid is a good astringent, and as such is extensively used in diarrhœa, more especially that which is so common in summer. It has also been advised, in the form of lemonade, as a prophylactic against painter's colic, and there is no doubt that it heightens materially the action of purgative salts, probably by increasing their solubility.

℞ Magnesii sulphatis ℥ij.; ferri sulphatis gr. xxiv.; acidi sulphurici diluti ʒij.; infusi calumbæ ad ℥viij. Misce, fiat mistura. Capiat cochlearia duo magna omni mane.

℞ Acidi sulphurici diluti ʒjss.; tincturæ opii ʒj.; syrupi aurantii ℥j.; aquæ ad ℥viij. Capiat unciam unam ter in die post singulas sedes liquidas.

ACIDUM SULPHUROSUM.

External Use.

The therapeutic properties of this acid depend in part on its very poisonous influence on the lowest forms of animal and vegetable life. Thus it forms a good application to those varieties of skin disease, as tinea tonsurans, chloasma, &c., which depend on the presence of a minute cryptogamic plant; and Dr. Dewar some years ago published a pamphlet in which he ascribed to this acid powers little short of marvellous. Going on the theory that a very great number of diseased conditions depend on the irritations of germs, Dr. Dewar most confidently advised its use in affections ranging from rheumatic fever to chilblains. Although experience has naturally not borne out his extravagant assertions, we have to thank him for making known to us the undoubtedly good effect of sulphurous acid in various forms of sore throat, used in considerable dilution either as spray or gargle. It is also the best

aerial disinfectant, as we know that the antiseptic properties of sulphur, when burnt for purifying purposes, depend on its formation.

Internal Use.

Sulphurous acid has been recommended by Dr. Lawson in pyrosis, the dyspeptic symptoms attending which are due to various forms of leptothrix and vegetable growths burrowing in the mucous membrane of the stomach; and in flatulence it is also deserving of a trial.

Dose.—℥ss. ad ℥j.

ACIDUM HYDROCYANICUM DILUTUM.

External Action.

Physiological.

Prussic acid, applied to the skin in a concentrated form, may cause at first slight irritation, but secondarily diminishes its sensibility, acting in some degree as an anæsthetic, probably from a benumbing influence on the extremities of the sensory nerves.

Therapeutical.

It is therefore used externally, largely diluted, to relieve neuralgic pain and allay itching, more especially in skin disease. We may thus hope to alleviate the tormenting irritation often attending prurigo and eczema; but we must be careful never to let the lotion come in contact with any abrasion on the surface, as prussic acid is very readily and rapidly absorbed.

Internal Action.

Hydrocyanic acid, being the most powerful and speedy poison with which we are acquainted, requires to be prescribed with very great caution.

Physiological.

1. *On the Nervous System.*—Prussic acid has some effect on the brain, causing giddiness and slight stupor: the respiratory centre in the medulla next becomes weakened, and the motor nerves are more or less paralysed, causing excessive muscular feebleness.

Therapeutical.

1. It is used with great benefit in those forms of dyspepsia attended with epigastric pain and vomiting following food, and whether depending on gastric ulcer or on mere irritation of the mucous membrane. It has also been given in whooping-cough; but in my experience its action is here very uncertain, and I have been unable to satisfy myself that it is a remedy of much value. In some forms of chronic and spasmodic cough it does good, but it is essentially in dyspepsia that we obtain real advantage from its use.

2. The *respiration* becomes slow and irregular, and finally ceases, death in cases of poisoning being generally due to suffocation. The sensory nerves are also enfeebled in their conducting power.

3. Prussic acid has a powerful sedative action on the *heart*, the circulation becoming slow, feeble, and irregular under the influence of poisonous doses; and this arises both from an influence on the nerves and on the mus-

3. It has been successfully employed in nervous palpitation.

cular structures of the heart itself.

It also acts directly on the blood, combining with the hæmoglobin of the red corpuscles, and preventing them from properly fulfilling their duty of carrying oxygen to the tissues.

4. Prussic acid has no special influence on the *temperature* or on *secretion*, save that the saliva is generally increased in quantity.

Prussic acid is very rapidly eliminated from the system, probably by the breath, and half an hour may be sufficient for this purpose; so that in a case of poisoning we may have good hopes of recovery if we can sustain the powers of life during this period.

Poisonous Effects.—In a large dose prussic acid kills immediately, the victim frequently uttering a loud cry, and expiring from cardiac syncope. If the quantity taken be smaller, symptoms of suffocation supervene from paralysis of the respiratory centre, and if the process of poisoning be more gradual still from deficient supply of oxygen in the blood; other symptoms noted being convulsions, great muscular prostration, dilatation of pupils, and quick,

Antidotes. — Considering the great rapidity of the action of hydrocyanic acid, it is comparatively seldom that we have any opportunity of employing antidotes; but, supposing we see a case sufficiently early to do so, we should have vigorous recourse to cold affusion and the inhalation of ammonia and chlorine water. Artificial respiration should be then steadily persisted in, and if we can thus counteract the tendency to death by suffocation,

feeble, irregular pulse. In fatal cases, post-mortem examination shows nothing characteristic.

If the poison be taken in a concentrated form death may ensue very rapidly, in less probably than a minute ; and Preyer, who has devoted special attention to the subject, has observed a guinea-pig to be apparently dead one second after inhaling some gaseous acid, all efforts at breathing having finally ceased in fifteen seconds. He therefore considers this to be the most deadly mode of its administration ; but no matter through which channel it enters the body, it speedily kills any animal, and, curiously enough, it is equally destructive to plants.

and tide the patient over the first half-hour, we may look forward to success, never despairing as long as the faintest pulsation can be felt in the heart. Secondary auxiliary means exist in the internal administration of ammonia, of chlorine water, or of carbonate of potassium, followed by the mixed sulphates of iron, which convert the poison into prussian blue ; and recently the subcutaneous injection of atropia has been proposed as the true physiological antidote.

Dose and Mode of Administration.

One grain of anhydrous acid has caused death, and of this the preparation used in medicine contains 2 per cent., the old Scheele's, which is now obsolete, having contained 4 per cent.

In consideration of the rapid way in which the acid is thrown out of the system, we must repeat the dose frequently, from every hour to every three hours ; and it is well not to order too large a quantity at one time, not because the acid tends to float on the top, as was formerly supposed, but because

there is always a chance of an overdose being given through ignorance or carelessness. We may safely prescribe from 2 to 6 minims, suspending it if the patient complains of any constriction about the throat, and for external use ʒij. may be dissolved in 8 ounces of water or rose-water.

℞ Acidi hydrocyanici diluti ʒij.; glycerini ℥j.; aquæ rosæ ℥viij. Misce, fiat lotio. In a case of troublesome itching.

℞ Acidi hydrocyanici diluti ♏xij.; misturæ amygdalæ ℥vj. Misce, fiat mistura. Capiat cochlearia duo magna tussi admodum ingravescente. For a case of irritable cough.

℞ Acidi hydrocyanici dil. ♏xxv.; bismuthi subnitratis ʒjss.; syrupi aurantii ℥j.; infusi gentianæ co. ad ℥viij. Capiat uncias duas ter in die ante cibum. In a case of irritative dyspepsia.

Or a few drops of prussic acid may be added to the ordinary effervescing draught with good effect.

AMMONIUM AND ITS SALTS.

Local Action.

Physiological.

The stronger preparations of ammonia are irritating to the skin, causing redness and speedy vesication on account of their power of dissolving the cuticle.

Chloride of ammonium, on the other hand, is rather soothing, and cools the skin by aiding the speedy evaporation of fluids.

The vapour of ammonia is stimulant and irritating.

Therapeutical.

Ammonia is therefore a component part of many stimulating liniments, and is an excellent counter-irritant and vesicant. It is a good application to the sting of insects or the bite of poisonous snakes.

Chloride of ammonium used to be an invariable ingredient in evaporating lotions.

Ammonia is used by inhalation in syncope, and as an

aid in the restoration of persons poisoned by prussic acid; but care must be taken not to allow its vapour to enter the air-passages too freely during unconsciousness, or serious inflammation may be produced.

Constitutional Actions and Uses.

I. *On Brain and Nervous System.*—The preparations of ammonia, generally speaking, are stimulant in their action, affecting, however, rather the ganglionic and spinal systems than the brain proper, and thus differing from alcohol.

Chloride of ammonium has, according to Anstie, the property of giving increased tone to sensory nerves.

II. *Circulation and Respiration.*—Ammonium increases the force and frequency of the heart's action, this ex-

I. Ammonia in its various preparations is very largely used as a stimulant in many cases of exhaustion and debility. It is the best means of combating the depressing influence of snake-bite; it is invaluable in bronchitis, pneumonia, and all typhoid conditions, being more diffusible and less stupefying than alcohol; whilst in prussic acid poisoning it may be administered internally as well as externally. Chloride of ammonium is very serviceable in many cases of neuralgia, and in those wearing muscular pains in hard-worked women and others usually described under the term myalgia.

plaining some part of its stimulating influence. It may also aid the breathing power by stimulating the respiratory centre and giving tone to the muscular fibres surrounding the bronchial tubes.

When injected into the blood, ammonia has the power of dissolving the red blood corpuscles, as well as of interfering with their oxygen-carrying functions. And it is also supposed to diminish the coagulating property of the blood, and to assist in the solution of fibrinous concretions already formed.

It has therefore been used with success by Richardson in those cases where, as after delivery, diphtheria, ovariotomy, &c., a clot is forming in the heart; and he recommends it by injection into the veins, stopping short at solution of the red corpuscles.

III. *On Secretion.*—Under this head it may be convenient to place—

1. The *emetic* action which is specially developed by large doses of carbonate of ammonium. This effect is also produced by injection into the blood.

1. Carbonate of ammonium is used as an emetic to assist in clearing the air-passages from accumulated mucus and in some cases of poisoning.

2. Ammonia increases the secretion from the bronchial mucous membrane.

2. This, in addition to the stimulant action, explains the great power of ammonia over bronchitis in the weak, young, or aged, and the later stages of pneumonia, where it promotes expectoration by thinning and rendering the sputa less tenacious.

3. *Intestinal.*—Ammonia in large doses increases the secretion from the intestines, and may cause diarrhœa, and it also neutralises acid secretions.

4. *Cutaneous.*—Ammonia, more especially in the form of liquor ammonii acetatis, acts freely on the skin.

5. *Urinary.*—No special action.

3. It is never used as a purgative, but this irritating action on the bowels may render it an undesirable form of stimulant in enteric fever. It is a useful antacid.

4. Liquor ammonii acetatis is one of our best diaphoretics in a great variety of feverish conditions.

5. Chloride of ammonium has been successfully used in intermittent hæmaturia.

Finally, ammonia has been employed under various conditions which cannot conveniently be grouped under any precise physiological heading; but these we will consider when we refer *seriatim* to the various preparations of the drug.

Poisonous Action. — If given in large quantities ammonia may cause death by inflammation of the stomach and intestines; and, according to Richardson, it may also kill by dissolving the red corpuscles of the blood.

Mode of Elimination.

Ammonia is very rapidly given out from the system, principally by the urine, but also in lesser degree by the breath and sweat.

Preparations.

Liquor ammoniæ fortior and liquor ammoniæ. These are seldom used internally, but occasionally, as mentioned above, by vapour and injection.

Liquor ammonii acetatis. Dose, 2 to 6 fl. dr.

Liquor ammonii acetatis fortior. Dose, 25 to 75 m.

Liquor ammonii citratis. Dose, 2 to 6 drachms.

Ammonii carbonas. This is the most active and efficient preparation, used as a stimulant in doses of from 3 to 10 grs., as emetic 30 grs. Some authors have looked upon ammonii carbonas as a specific for scarlet fever, but of the soundness of this view no sufficient evidence has been produced. It is nauseous and pungent, and must be well disguised, milk being a good vehicle.

℞ Ammonii carbonatis gr. xxxx.; tincture scillæ ʒij.; syrupi tolutani ʒiij.; infusi senegæ ℥vij. Misce, fiat mistura. Capiat unciam unam quartâ quâque horâ. Stimulating expectorant.

Spiritus ammoniæ aromaticus. Dose ʒss. to ʒj. This contains nutmeg, lemon, and spirit in addition to the ammonia.

Ammonii chloridum. Used as a tonic in neuralgia in doses of from 20 to 30 grs.; but it is very nauseous, resembling sea-water in flavour.

℞ Ammonii muriatis ʒij.; ext. glycyrrhizæ ℥ss.; syrupi tolutani ℥j.; aq. cinnamomi ad ℥viij. ℥j. quartis horis. In neuralgia.

It has also, but with little real foundation, been supposed to possess some power of aiding the absorption of lymphatic and glandular enlargements, and is regarded by good Indian authorities as a reliable remedy in chronic liver disease, and in hepatitis and hepatic abscess.

Ammonii bromidum seems to have an occasional and uncertain influence over whooping-cough, and is thought by some to be a good substitute for bromide of potassium in epilepsy and other nervous disorders. Dose, 10 to 20 grs.

Liquor ammonii acetatis and liquor ammonii citratis. Diaphoretic in doses of from ʒij. to ℥j.

℞ Liq. am. acetatis ℥ij.; syrupi limonis ʒj.; sp. æth. nit. ʒiij.; infusi serpentariæ ad ℥viij. ℥j. quartis horis. Diaphoretic mixture.

Ammonii benzoas, ammonii nitras, and ammonii phosphas are seldom if ever used.

ALUM.

Local Action.

Physiological.	*Therapeutical.*
Alum used externally tends, like most astringents, to contract the blood-vessels and condense the tissues by coagulation of their albumen.	It is therefore much employed as an astringent lotion in conjunctivitis, leucorrhœa, gonorrhœa, and as a gargle in sore throat.

Internal Actions and Uses.

1. *On Nervous System.*—Alum seems to have some power in relieving spasmodic action.	1. It is therefore beneficial in some cases of whooping-cough and in colica pictorum.
2. *Circulation.*—This, no doubt, is intimately connected with No. 1, as the contraction of the blood-vessels and internally astringent effects which follow the use of alum are probably dependent on nervous influence.	2. Alum has been used for internal hæmorrhage, and to check excessive sweating, and its action in whooping-cough is also largely due to its astringent properties, as it is most useful in the later stages, when profuse secretion has been established.
3. *On Secretion.* — Alum occasionally acts both as an emetic and as a purgative.	3. This also explains its use in colica pictorum.

Dose.

In lotion, gr. ij. ad x.:—

℞ Aluminis gr. x.; aquæ rosæ ʒiv. Lotion in catarrhal ophthalmia.

Internally, gr. x. ad xx.:—

℞ Aluminis ʒij.; acidi sulphurici dil. ʒj.; syrupi limonis ʒj.; aquæ ʒiij. ʒss. secundâ quâque horâ. In colica pictorum.

As purgative, gr. xl. ad lx.

Glycerinum aluminis is a recent addition to the B. P.

ANTIMONY.

(Principally used under the form of Tartar Emetic.)

Local Action.

Physiological.

Externally applied, tartar emetic causes redness and inflammation of the skin, followed by an eruption of papules becoming vesicular, and finally forming pustules closely resembling those of small-pox.

Therapeutical.

Tartar emetic used to be extensively employed in the form of ointment as a counter-irritant, but was found occasionally to cause inflammation, and to leave unsightly scars.

Internal Actions and Uses.

I. *Brain and Nervous System.*—Tartar emetic under certain conditions, and more especially when combined with opium, exerts a sedative influence on the brain.

When given in poisonous doses, paralysis, probably of spinal origin, and associated with diminished reflex irritability, sets in.

I. Its use in this combination was originally recommended by Graves, and has been endorsed by Murchison, in the violent delirium of typhus, and it has also been employed with benefit in delirium tremens.

II. *Circulation and Respiration.*—Antimony is sedative in its operation on the

II. The depressing influence of tartar emetic on the circulation caused it to be

heart and vascular system, the heart's action becoming slow, weak, and finally irregular, the arterial tension lowered, and the pulse soft and compressible. The respiration also grows slower, and an increased secretion takes place from the bronchial mucous membrane.

General muscular relaxation is observed.

III. *On Secreting Organs.*—1. *Stomach and Intestines.*—Antimony is an effectual emetic, its action being slow, however, and attended by a good deal of depression. It acts either when swallowed or by subcutaneous injection; very commonly used in former years in acute inflammations, and more especially pneumonia; but this practice has now been almost generally abandoned, as it was found that such treatment, whilst exerting no real influence over the course of the disease, tended to reduce the strength of the patient and cause lingering convalescence. Small doses, however, are found useful in croup, and in the broncho-pneumonia of children where great dyspnœa and fever exist with excessive bronchial secretion; and it is a good general expectorant in asthma, bronchitis, &c.

Its relaxing effects on the muscular system were formerly taken advantage of for the reduction of herniæ and dislocations; but it has of course been quite superseded by chloroform and other anæsthetics.

1. Antimony is too slow and depressing an emetic to be used in cases of poisoning, but it is of service in croup, whooping-cough, bronchitis, &c., where we wish to relax the bronchi and get rid of accumulated secretions.

but the balance of experiment goes to show that in either case the effect is produced by reflex action following irritation of the nerves of the stomach. Some increase of secretion from the intestines and consequent diarrhœa are occasionally observed.

In former years, when antimony was freely given, what was called tolerance used to be an interesting therapeutic result. That is to say, in feverish conditions it was found that large quantities of the drug might be taken without producing vomiting; and this has been explained by the observation that antimony, to act as an emetic, must previously be dissolved in the gastric juice; a secretion which is, in great measure, checked during fever. Gubler explains the tolerance more simply by suggesting that the system is too weak to carry out the complicated mechanism of vomiting.

2. *Skin.*—Antimony has a powerful diaphoretic action.

2. Antimonial wine is a common adjunct to diaphoretic mixtures. On account of its chemical affinities with arsenic and phosphorus it has been prescribed in scaly skin affections; and although my own experience hardly bears out the success recorded by others, several good authorities, like Malcolm Morris and Spender, have faith in its use in doses of 15 to 20 m. every three hours.

Poisonous Action.—Death

Antidotes.—Emetics, tea,

may occur from the collapse following prolonged vomiting and purging, or may be the result of gastro-intestinal inflammation. Post-mortem examination of a protracted case generally discovers parenchymatous degeneration of the liver and other internal organs.

coffee, tannin, stimulants, &c.; and the stomach must be evacuated by the stomach-pump and the free administration of hot water.

Preparations.

Antimonium tartaratum. Dose, $\frac{1}{16}$ gr. to $\frac{1}{4}$ gr., as emetic 1 to 3 grs. In the bronchitis of children from $\frac{1}{16}$ gr. to $\frac{1}{10}$ gr.

Vinum antimoniale. Dose, 15 to 40 minims.

Unguentum antimonii tartarati.

Pulvis antimonialis. This is the well-known patent preparation known as James's Powder, which used to be more popular than it is now.

None of the other preparations of antimony have any therapeutic value.

Mode of Elimination, &c.

Tartar emetic rapidly enters the blood, and is eliminated by the bile, milk, sweat, urine, as well as the gastro-intestinal glands.

Prescriptions, &c.

Tartar emetic, on account of its tastelessness, may be well given dissolved in simple distilled water; and Ringer tells us—and I have amply confirmed his statements—that we may do much good, in some forms of acute bronchitis in children, by dissolving a grain of the salt in a pint of water, and giving a teaspoonful every quarter of an hour for the first hour, and then hourly.

In the case of adults, when we wish to avoid the nauseating

effects of the drug, we may best do so by the following formula: ℞ Antimonii tartarati gr. ij.; acidi hydrocyanici diluti ɱxxx.; tincturæ lavandulæ compositæ ʒss.; aquæ destillatæ ad ʒvj. ʒss. quartis horis.

℞ Liq. op. sed. ʒj.; ant. tart. gr. j. ad gr. ij.; mist. camph. ʒvj. Misce. Sumat semunciam omni horâ donec somnus supervenerit. Highly recommended by Graves and Murchison in the insomnia and delirium of typhus fever.

SALTS OF SILVER.

Local Action.

Physiological.

The nitrate of silver hardens primarily, but secondarily destroys the cuticle, and condenses the tissues by coagulating their albumen. Its application may cause ulceration of the healthy skin, and checks the activity of granulating surfaces. A convenient form is the *argenti et potassii nitras* of the B. P. used in pencils.

Therapeutical.

Nitrate of silver, either in substance or solution, has been used to check the spread of erysipelatous inflammation, to arrest the pitting of small-pox, and to avert the formation of bed-sores.

It is a good injection for gonorrhœa or collyrium for conjunctivitis, and a strong solution is one of our best remedies for various relaxed or ulcerated conditions of the fauces. In substance lunar caustic forms a good application to simple venereal sores, ulcerated tonsils, or to any ulcerating or granulating tissue, when we wish to repress exuberant granulations or excite a new and more healthy action.

Internal Actions and Uses.

Silver is now but little employed internally. It formerly enjoyed a great reputation in the treatment of nervous disorders; and Erb and Seguin hold it to be of great value in the earlier stages of locomotor ataxy. I am, however, quite convinced, from my own observation, that it is sometimes useful in epilepsy, more especially as replacing bromide of potassium, when that valuable remedy has temporarily lost its power over the disease.

And, again, it seems to be the only curative agent in some peculiarly severe cases of gastralgia, patients occasionally willingly running the risk of disfigurement in the hope of cure. In prescribing it, we must never forget its power of causing an indelible and most unsightly greyish-blue discoloration of the skin, seldom appearing, however, before the salt has been used for three months.

Dose from gr. $\frac{1}{4}$ to gr. ij., preferable in the form of pills, on account of its insuperably nauseous taste.

ARSENIC.

Local Action.

Physiological.

Externally applied, arsenic causes redness and inflammation of the skin, followed by ulceration and sloughing. Absorption readily follows its sparing use, but the inflammation following its more vigorous application will abolish temporarily the absorptive powers of the skin.

Therapeutical.

Arsenic has been employed as a caustic in cancer and allied diseases; but not only is its action difficult to regulate, but dangerous symptoms of poisoning have resulted from the very ready way in which it is absorbed by the skin. Its gentle application, however, in the form

of ointment or paste is of distinct service as a stimulant in lupus and some other obstinate forms of chronic skin disease. Billroth advises its use by parenchymatous injection, as well as internally in 'malignant lymphoma.'

Internal Actions and Uses.

I. *On Brain and Nervous System.*—Arsenic has a tonic influence on the nervous system generally. Symptoms of paralysis are among the indications of arsenical poisoning, and after death the metal may be detected in the grey matter of the cord.

I. This may in some measure explain its anti-periodic properties, for it is well known that arsenic is only second to quinine in its power of arresting the various manifestations of ague.

It is also a valuable remedy in neuralgia, and chorea may frequently be cured by full doses.

II. *Circulation, Respiration, and Temperature.*—In small doses arsenic may stimulate cardiac action in a slight degree; and the experience of the arsenic-eaters of Styria shows that its use improves their wind, and enables them to undergo great exertion without fatigue. Under strictly physiological conditions, it has been shown that the use of arsenic rapidly diminishes both the red and the white blood corpuscles.

II. Arsenic is of service in spasmodic asthma, hay asthma, some forms of chronic bronchitis, and even in chronic phthisis. In non-tubercular lung consolidation it brings about fatty degeneration and rapid absorption of the effused products, and thus prevents the development of phthisis, by removing the nidus for the inoculation and development of the bacillus. (Brunton.) The Monte Dore mineral waters, so much recommended

In anæmia, the red corpuscles are at first increased, but afterwards diminished. The temperature tends to fall under the use of arsenic.

III. *On the Secreting Organs.*—1. *Digestive Tract.* In small doses arsenic stimulates the appetite and increases the digestive powers, but if used more freely symptoms of irritation set in, which may terminate in gastro-enteritis. Arsenic has a direct action on nutrition by diminishing oxidation, and thus preventing wasting, the red corpuscles being somewhat restrained in their proper function of promoting the perpetual exchange carried on by their means between O and CO_2.

in asthma, are held to owe their efficacy to the arsenic which they contain.

III. Ringer recommends small doses of arsenic—1. In a form of irritative dyspepsia with red tongue and prominent papillæ, in the morning vomiting of drunkards, and in that variety of diarrhœa which leads to the evacuation of the bowels immediately after eating. It is now thoroughly established that the inhabitants of Styria eat arsenic to the extent of gr. j. to gr. ij., and thrive on it, becoming fat and ruddy, and that it is occasionally given to horses with the view of improving their coats. Dr. Maclagan had the opportunity of seeing an arsenic-eater consume his dose, and of subsequently detecting the presence of a large quantity of arsenic in his urine, and Knappe has actually seen 8 grains consumed at once. It is stated that as much as 14 grains have been eaten at once, arsenious acid or orpiment being most generally used.

2. *Cutaneous.* — Arsenic, being eliminated through the skin, occasionally causes sweating, itching, and tingling, and the appearance of eruptions, which may either be vesicular, papular, or pustular, or of the nature of urticaria, occasionally attended with pyrexia. These, however, are extremely rare, and have never occurred within my own experience; nor have I ever observed boils and carbuncles, or that brown staining of the skin which has been described as somewhat more commonly following the administration of arsenic. That the nutrition of the skin is much affected by arsenic is shown by experiments, in which desquamation of the epidermis, and degeneration and partial solution of the protoplasm of the cells, resulted in frogs poisoned by the drug.

2. In dry scaly affections of the skin, such as psoriasis, in the dry stages of eczema, in pemphigus, in acne, in chronic urticaria, and in lichen, arsenic acts most admirably; but we must be careful never to give it during the acute stage of any skin affection, as under these circumstances it is invariably found to aggravate the symptoms. It is quite useless in strumous or syphilitic diseases of the skin. Arsenic is much valued by Balfour and others in chronic rheumatism, and more especially rheumatic arthritis. We may explain the success of arsenic in cutaneous affections either by its influence on the nutrition of the cell growth of the skin or by its action on the nervous system, it being an undoubted fact that its curative powers are best marked in those skin disorders which are of neurotic origin. Excellent though its effects frequently are, it is often disappointing, and will fail to cure the disease for which it is administered. But in psoriasis, if we get the case early, and treat it regularly and boldly, continuing

the administration of the drug in small doses for some time after the eruption has disappeared, we can usually hope for good results, remembering that relapses are extremely common in this disease. Some authorities hold that in order to get full value from the use of arsenic we must produce physiological symptoms; but my own experience is entirely opposed to this.

It is asserted that it may be useful in incipient cirrhosis, by stimulating hepatic tissue change. Dr. Lauder Brunton records an interesting case of cure by arsenic of albuminuria, due in all probability to deficient pancreatic digestion of albumen.

3. *Liver*.—Arsenic in poisonous quantities causes, like phosphorus and antimony, fatty or parenchymatous degeneration of the liver.

4. *On Urine*.—The urea is diminished. Albuminuria has been observed to accompany the puffy swelling of the eyes, resulting from chronic arsenical poisoning. See that the urine is normal before prescribing arsenic.

5. Arsenic, like phospho-

rus, has been observed to promote the formation of bone in young animals.

Poisonous Effects. — Poisoning by arsenic is ushered in by pain in the stomach, salivation, thirst, vomiting, diarrhœa, headache, fever, and disturbed sleep, followed by more acute symptoms and death from collapse—a train of consequences much resembling those met with in cases of true cholera.

After death, in addition to the usual pathological appearances of gastro-enteritis, we find fatty degeneration of the heart and muscles, and parenchymatous degeneration of the liver, kidneys, &c.

Antidotes.—After evacuation of the stomach we must give freshly calcined light magnesia or the hydrated sesquioxide of iron freshly prepared. The solution of dialysed iron is a convenient form.

Mode of Elimination.

Arsenic is rather slowly removed from the body by the intestines, the urine, the skin, and all the secretions but the milk. Traces have been found in the urine sixteen days after administration.

Mode of Administration, Cautions, &c.

Persons vary much in their susceptibility to arsenic, and we must invariably begin its use with caution, keeping in mind that children bear it well, that a child of five can take with impunity as large a dose as an adult, and that old people, on the other hand, are somewhat easily affected by it.

We must also remember that although the Styrian peasants can accustom themselves to large and increasing doses,

the experience of medical practice shows that, after a certain time, patients taking this drug are liable to show some of the following symptoms :—Smarting and itching about the conjunctivæ with injection of the vessels, and puffy swelling below the eyes, nausea and vomiting, which are, on the whole, the most common symptoms ; pain in the stomach and the so-called silvery tongue, the mucous membrane looking as though it had been brushed over with a coating of mucilage, through which enlarged red papillæ may be very distinctly seen.

Debility, dyspnœa, troublesome cough, headache, pains in the limbs, and general digestive derangement (diarrhœa, colic, &c.), have been observed, but more usually in connection with that chronic arsenical poisoning not uncommon from wall papers, artificial flowers, dresses, &c. &c.

The probabilities of these unpleasant symptoms are much lessened, however, by advising that the dose should always be taken after a meal.

The mode in which arsenic is usually given is in the form of liquor arsenicalis, which is merely a solution of arsenious acid and carbonate of potassium flavoured with tinct. lavand. co., containing gr. ss. in ʒj., and of which the dose is, as a general rule, from ♏ij. to ♏v. ; but in some obstinate affections, like chronic rheumatic arthritis, it is requisite to push the quantity as far as ♏x. or even ♏xv. In skin diseases I am strongly in favour of beginning with a large dose, and pushing the drug vigorously. Small doses seem more liable to cause irritation than large. Dr. McCall Anderson warns patients taking arsenic to beware of taking cold. Being almost tasteless, liq. arsenicalis is best given simply in water.

The liquor arsenici hydrochloricus, sodii arsenias, and ferri arsenias are rarely used, their respective doses being 2 to 8 minims and $\frac{1}{12}$ gr. to $\frac{1}{2}$ gr. ; and the *liquor arsenii et hydrargyri iodidi*, or *Donovan's solution*, which is supposed to have a special influence over syphilitic skin diseases on account of its combination of arsenic with iodine and mercury, has

been introduced into the last edition of the British Pharmacopœia along with the *arsenii* iodidum from which it is made.

Dose.—10 to 30 minims.

℞ Liq. arsenicalis . . .	℥ij.	℥
Am. carb.	℥ss.	℥j
Potassii acetatis . . .	℥j.	℥ij
Syrupi	℥ss.	℥j
Aquæ ad	℥xij.	℥vj

℥ss. in a wineglassful of water twice a day after food. A combination highly praised by Dr. McCall Anderson in psoriasis, more especially when occurring in spirit drinkers.

BISMUTH.

Local Action.

Physiological.

Bismuth has no action on the unbroken cuticle, but, applied to a raw or mucous surface, it is sedative and astringent.

Therapeutical.

It is a good application to intertrigo, ulceration about the mouth, and as an injection in gonorrhœa and leucorrhœa. It has lately been recommended as a snuff to check cold in the head, and the liquor has been praised as an application to prolapsus ani. (Cleland.)

Internal Actions and Uses.

On Digestive Tract.—Bismuth is sedative to the stomach, and exerts an astringent influence over the intestines, probably in virtue of its local effects.

Bismuth is one of our most valued remedies in many forms of dyspepsia, the main indications for its use being pain and vomiting. When a patient suffers acute pain after eating, with or without

sickness, the tongue being clean and flatulence present, we may give bismuth with much confidence, and it is also of service in the vomiting of drunkards, in pyrosis, and in many forms of diarrhœa, more especially that met with in children.

Mode of Elimination.

Very little bismuth is absorbed, and it is principally thrown out of the system by the intestines, to whose secretion it imparts a blackish hue, from the formation of a sulphide.

Mode of Administration, &c.

The subnitrate of bismuth, which is the most effective preparation, may be given simply in powder, either by itself or in combination with charcoal or soda; or it may be given in solution with hydrocyanic acid, gentian, &c. the dose being from 5 to 20 grs., and large doses being preferable.

℞ Bismuthi subnitratis ʒij.; mucilaginis ℥j.; acidi hydrocyanici diluti ♏xxx.; infusi gentianæ ad ℥vj. ℥ss. ter die.

℞ Liquoris bismuthi et ammonii citratis ʒiv.; syrupi aurantii ℥v.; infusi calumbæ ℥v. Misce. Sumat unciam unam ter in die.

℞	Bismuthi oxidi . . .	ʒj.
	Acidi oleici . . .	℥j.
	Ceræ albæ . . .	ʒiij.
	Vaselini	ʒix.
	Ol. rosæ	gt. j.

A soothing ointment much recommended by Dr. McCall Anderson in eczema.

℞ Morphinæ hydroch. . . gr. ij.
Acaciæ gum. pulv. . . ʒij.
Bismuthi subnit. . . ʒvj.
Ft. pulv.

Ferrier's snuff for cold in the head, influenza, and hay fever.

The carbonate and oxide of bismuth are seldom used, but an agreeable preparation, less effectual, however, than the subnitrate, is known as the liquor bismuthi et ammonii citratis, which contains gr. iij. of the oxide to the drachm; and lozenges, containing each gr. ij. of the subnitrate, are also included in the Pharmacopœia, or we may prescribe gr. v. of bismuthi citras or the bismuthi et ammonii citras.

CALCIUM (LIME AND CHALK).

Local Action.

Physiological.

Some of the preparations of lime, used externally, are sedative or soothing; others are astringent.

Therapeutical.

Lime is used as a soothing application to burns, as in the linimentum calcis; and lime water makes a good injection for leucorrhœa or enema for the destruction of thread-worms.

Internal Uses.

Lime, taken internally, neutralises acid secretions, and has astringent properties.

It is therefore used with benefit in some forms of dyspepsia and in diarrhœa, liquor calcis being the most generally employed preparation. Lime water is also of great service in preventing the curdling

which often causes milk to disagree with patients of weak digestion.

Chalk is more astringent than lime, and is an excellent remedy, either alone or in combination with opium, for diarrhœa.

Chloride of calcium has been highly praised in 20-grain doses as a remedy for various forms of scrofula. Liquor calcii chloridi 15 to 50 minims.

Phosphate of calcium has been highly praised by Ringer in doses of from 1 to 2 grs. in rickets, where it acts by improving the general nutrition of the system, and supplying structural elements in which the growing bones of badly nourished children are often deficient. The best period for its administration is when the acute stage has passed away, as indicated by the cessation of tenderness.

It is also of use in anæmia and general debility and some forms of diarrhœa. More than one or two grains is useless, as it will not be absorbed.

Sulphide of calcium is useful in various skin affections attended with suppuration, such as acne, hordeolum, and the furuncular diathesis, hastening the maturation of boils and lessening the tendency to fresh formations.

It is also a good remedy in strumous ophthalmia and the scrofulous sores of children. Dose gr. $\frac{1}{4}$ in a few grains of sugar of milk, or, better, in perles, which prevent decomposition and conceal the disagreeable odour of the drug.

Thorowgood much values the hypophosphite of calcium in phthisis.

Calcii sulphas and calx sulphurata have recently been added to the B. P.

CERIUM.

The oxalate of cerium, in doses of from gr. j. to gr. ij., is a popular remedy in the vomiting of pregnancy, its mode of action being quite unexplained, and its success being, according to my own experience, greatly exaggerated. We are told, however, that this want of success is the result of giving too small doses, and that 10 grains will really be of service in the troublesome condition for which it is usually prescribed.

It is generally prescribed in the form of pill.

℞ Cerii oxalatis gr. xxiv.; extracti gentianæ gr. xxxvj. Misce, fiant pilulæ duodecim, quarum capiat unam bis in die.

CIMICIFUGA (ACTÆA RACEMOSA).

This drug was introduced into practice in this country some years ago by Sir J. Simpson, who praised it highly in chronic rheumatism, lumbago, and hypochondriacal depression. It has been found useful in America as an emmenagogue, and has been recommended in chorea, for which so many drugs have in turn been prescribed, but has never taken any real hold upon professional attention at home.

Dose of the tincture, 10 to 30 minims; of the liquid extract, 20 to 30 grs.

COPPER.

Local Action.

Physiological.

Copper has caustic and astringent properties either in substance or solution.

Therapeutical.

In the form of the familiar bluestone or sulphate of copper, it is used as an application to venereal sores, ulcers in the throat, granular lids, to check exuberant granulations, &c.; and in solution it is a good lotion for various ulcerative surfaces, gleet, &c.

Internal Actions and Uses.

Physiological.

1. *Brain and Nervous System.*—Copper probably acts in some measure as a nervine tonic, but when given in larger doses peculiar symptoms set in, not unlike those of lead poisoning, and consisting of headache, neuralgic pains, cramps, and even paralysis.

2. *Circulation and Respiration.*—No special effect.

3. *Secreting Organs.* — Copper causes prompt and effectual evacuation of the contents of the stomach, acting as a direct emetic. It has an

Therapeutical.

1. Copper has been used in small doses in chorea, epilepsy, &c., but with no specially marked benefit.

3. Copper is not so much used, however, for an emetic as sulphate of zinc, because, if by any chance it be not rejected by vomiting, it is liable to

astringent influence over the stomach and intestines, and this, if pushed too far, may end in gastro-enteritis.

cause inflammation of the stomach.

Sulphate of copper is a good astringent in advanced and obstinate diarrhœa.

Mode of Elimination.

Copper is eliminated chiefly by the liver and kidneys, the intestinal canal, and the salivary glands.

Poisonous Effects.—As already seen, copper may act as a poison by causing inflammation of the stomach and intestines, as well as remote nervous symptoms.

Antidotes.—Albumen, ferrocyanide of potassium, followed by prompt evacuation of the stomach.

Sulphate of copper is the only salt of the metal used in medicine, and is prescribed in the following doses :—

℞ Cupri sulphatis, pulveris opii, āā gr. ss. ; extracti gentianæ gr. iij. Misce, fiat pilula nocte maneque sumenda. In a case of obstinate diarrhœa. The oleate of copper has recently obtained a considerable reputation as an application in ringworm.

Cupri nitras has lately been added to the B. P.

IRON.

Local Effects.

Physiological.

Certain of the stronger preparations of iron are very astringent, corrugating and hardening the tissues by coagulating their albumen, and also contracting the smaller blood-vessels.

Therapeutical.

In the form of the perchloride iron is one of our most generally used astringents for the arrest of hæmorrhage, as in epistaxis, leech-bites, in flooding injected into the uterus, as advised by

Dr. Barnes, or, in fact, in any variety of passive hæmorrhage.

It is also a valuable application to relaxed mucous membranes; thus, in many forms of sore throat, equal parts of tinct. ferri and glycerine will act well. It forms a good injection for leucorrhœa, and is extensively employed as an enema for the destruction of thread-worms. Velpeau recommended the application of a strong solution of sulphate of iron to the inflamed skin in erysipelas, and Ricord considers that tartrate of iron has an almost specific influence over the destructive ulcerative process of syphilitic phagedæna.

Internal Actions and Uses.

Physiological.

1. *Brain and Nervous System.*—Iron has a tonic influence over the nervous system, but occasionally, in plethoric persons, the stronger preparations will cause an uncomfortable sensation of fulness and throbbing in the head.

Therapeutical.

1. Iron is much used as a tonic in all conditions of nervous exhaustion and debility. Thus in neuralgia, which consists in a weakened state of the roots of certain sensory nerves, it is invaluable. In chorea, which generally coincides with debility, and in all cases depending in any way on want of nerve tone,

2. *Circulation and Respiration.*—Iron acts as a tonic to the muscular structures of the heart, probably by affording the stimulus of a large supply of healthy blood. It is held to increase the plasticity of the blood, and to augment the number of red corpuscles by passing into and stimulating the lymphatic glands and encouraging the transformation of the lymph globules.

Recent researches have proved that no action of this sort is effected in healthy blood; but that in anæmia the number of red corpuscles is rapidly increased under the use of iron, without any primary rise in the quantity of

it is a remedy of real value. Brown-Séquard and Hughlings Jackson have pointed out that iron usually disagrees in epilepsy, increasing the tendency to fits. Gowers, whilst agreeing with this as a general rule, believes that in some cases it does no harm, whilst in those on the borderland between epilepsy and hysteria it may even be of use, by acting as a nervine tonic.

2. This increase in the red corpuscles of the blood, and, as a consequence, in the extent to which these important bodies carry out their function of bearing oxygen to the tissues, and finally converting it into ozone, explains further the marvellous tonic influence of iron. The benefit in anæmia very quickly follows this actual numerical increase, as indicated by Gowers' ingenious and practical modification of Malassez Hayems' method for microscopical proof of the augmented number by careful daily counting. In anæmia, in protracted convalescence from acute disease, in general feebleness or debility, in chlorosis, where it also acts by

hæmoglobin which they contain. As a secondary result, however, the hæmoglobin also is increased, and the number of red corpuscles may then even diminish.

giving increased tone to the uterine functions, in struma, rickets, secondary syphilis, &c., iron forms the basis of every method of treatment. Grainger Stewart praises the use of the tincture of iron in the cerebral anæmia, giddiness, and headache so often met with in valvular disease, more especially of the aorta.

3. *On Secreting Organs.*—On the stomach, iron acts by bracing up the mucous membrane and improving the appetite and digestive tone.

3. Here we have another explanation of its tonic properties.

Its astringency tends to cause constipation.

This action is utilised in the treatment of diarrhœa, where some of the more astringent preparations, as the pernitrate, are often of service.

But in ordinary tonic doses the perchloride of iron relieves vesical irritation, and is useful in gleet and chronic Bright's disease.

Urine.—Iron increases the amount of urea given off by the urine, and occasionally irritates the bladder, causing frequency of micturition.

On Temperature. — Iron raises the temperature partly by increasing the waste of the tissues, but partly also in virtue of its ozonising properties.

Specific Actions.

Iron has a very marked influence in checking erysipelas, which must be called specific. We here use the tincture of the perchloride, and give it in doses of from ʒss. to ʒj. every

three or four hours. It is also of service in diphtheria, and Dr. Russell Reynolds has lately brought the evidence of over sixty cases to show that in acute rheumatism, given in large doses, it rapidly diminishes the pain and fever.

Mode of Absorption and Elimination.

The more soluble forms of iron are readily absorbed, and become combined as albuminates with the albumen of the blood, whilst the insoluble preparations must first undergo solution in the gastric juice. When they have played their part within the organism, they are thrown out principally by the fæces, to which they impart a blackish colour, but also in some measure by the pigment of the urine, the hair, skin, nails, and epithelium, and by albuminous secretions, such as those of the bile, and all mucous and serous membranes.

Modes of Administration. Drawbacks.

We have seen that various inconveniences may attend the use of iron, such as headache, irritability of the bladder, constipation, nausea, &c., and it further has the disadvantage of blackening the tongue and teeth; but many of these evils may be avoided by using the lighter or less astringent preparations, such as the citrate of quinine and iron, vinum, saccharated carbonate, by combining some aperient, and by giving each dose after a meal. The dyspepsia and hepatic congestion occasionally attending the use of the tincture in large doses may best be alleviated by adding one grain of the chloride of ammonium to each minim. (Grainger Stewart.)

But if no contra-indication exists, there is no doubt that the astringent properties of the per-salts stand us in good stead, and in particular no preparation is so useful on the whole as the old muriated tincture. In secondary syphilis the syrup of the iodide is of service, and children will always take steel wine or the saccharated carbonate well; whilst in

cases of chlorosis with disordered menstrual function we shall find the mist. ferri composita to be very efficacious in improving the quality of the blood and gently stimulating the uterus to resume its neglected duties. The sulphate of iron has some influence in aiding the action of some purgative salts, as the sulphate of magnesia. The preparations of iron are so very numerous that no one but a student on the very brink of an examination would think of burdening his memory with them all, and we shall only refer, therefore, to those which form part of the daily stock-in-trade of the practical physician. Dialysed iron (*liquor ferri dialysatus*) has recently come into fashion, and is said to be effective and well borne as a tonic in dose of 5 to 20 min., whilst we are also told that it is a good and readily procurable antidote in cases of arsenical poisoning.

Vinum ferri may be given in doses of from ʒj. to ʒij.; mistura ferri aromatica, ℥j. ad ℥ij.; mistura ferri composita, ℥j. ad ℥ij.; ferri carbonas saccharata, gr. v. ad ʒj.; syrupus ferri iodidi, ♏xx. ad ʒij.; ferri et ammonii citras, gr. v. ad x.; ferri et quininæ citras, gr. v. ad xx. Liquor ferri acetatis, ♏v. ad ♏xxx.; liquor ferri acetatis fortior, ♏j. ad ♏viij., are recent additions to the British Pharmacopœia.

℞ Tincturæ ferri perchloridi ♏x.; spiritûs chloroformi ♏xv.; glycerini ʒss.; infusi calumbæ ad ℥j. Ter die sumend. Chalybeate mixture.

℞ Misturæ ferri compositæ, decocti aloes compositi, āā ℥ss. Misce, fiat haustus ter die sumendus.

℞ Magnesii sulphatis ℥ij.; ferri sulphatis gr. xxiv.; acidi sulphurici diluti ʒij.; infusi calumbæ ad ℥viij. Misce, fiat mistura. Capiat cochlearia duo magna omni mane. Ferruginous aperient.

℞ Tinct. ferri perch. ʒij.; pot. cit. ʒj.; syrupi limonis ℥jss.; aquæ ad ℥ij. An agreeable combination.

Iron, as a rule, is best taken after a meal, but we must warn our patient to avoid the neighbourhood of tea, as the mixture of these two ingredients forms a species of ink which

is both nauseous and unsightly. As the more astringent preparations not only stain but injure the teeth, they may be conveniently sucked through a glass tube.

TONICS.

The word tonic is undoubtedly vague from the strictly scientific standpoint, but we may congratulate ourselves that zeal for more precise nomenclature has not yet succeeded in depriving us of a term which has now included so many associations of an empirical kind. The best example of tone probably is the gentle and permanent contraction of the muscular tissue which is kept up in the healthy body by the central nervous system, and which, when suspended by disease, is familiar to us all in the flaccid and powerless limb of paralysis; and an appropriate remedy is found in electricity, which improves the nutrition and status of the part. We have vascular tone also, in which the due calibre of the arteries is regulated by the action of the vaso-motor nerves; and were we asked to name two tonic remedies which reinforce these important functions, we might unhesitatingly point to strychnia, which aids the nervous tone, and digitalis, which raises the arterial tension by stimulating the vaso-motor centre.

But treating our heading in a more general sense, we are justified in calling anything a tonic which improves the general health; and thus an emetic, or a purgative, or a narcotic, or a sedative may really have tonic properties by removing obstruction or irritation, and giving rest to fatigued or worn-out organs. The best of all tonics, after all, are those which cannot well be included in any therapeutical tables; for what can equal the bracing properties of sea-bathing, of change of air and scene, of the keen whiff of exhilarating ozone on a Swiss glacier or a Scotch moor, of a day's hunting or shooting, or a ramble along a good trout stream when fish are well on the take? A good dinner, with a glass of good wine, cheerful

society, the stimulus of hope, even the rousing effect of a sudden reverse of fortune, may be often more successful than mere drugs; but in considering the varying modes of treatment for debility in its many forms we may usefully divide our therapeutic resources in the following way:—

I. Nervine Tonics.

Physiological.

1. First among these we may rank agents acting directly on the brain, reducing its blood supply and giving it rest.

2. Then, again, certain drugs act on special centres; thus strychnia and digitalis stimulate the vaso-motor centre, atropia the respiratory centre; and strychnia stimulates the spinal cord.

Finally, we have those substances generally known under the somewhat vague title of nervine tonics. These are principally metals, such as arsenic, phosphorus, zinc oxide, and zinc sulphate; but quinine and ammonium chloride have also good right to be included in the list.

Therapeutical.

1. Under certain conditions of mental excitement, or worry, or debility, no tonic can be so good as a sound night's rest, and the narcotic class of remedies act well by supplying this.

2. Strychnia and nux vomica are of great service by aiding the circulation through the medium of the vaso-motor centre, and helping the spinal cord to resume its full functions when it is weakened by any debilitating cause. The nervine tonics are used not only in simple debility, but in special conditions of nervous weakness. Thus quinine, arsenic, and ammonium chloride are of service in neuralgia, probably by giving increased tone to sensory nerves: the zinc salts are useful in the irregular muscular contractions of chorea, and in the loss of the presiding nervous

control which characterises hysteria.

II. Vascular Tonics.

This class of remedies may act in three different ways:—

1. On the heart itself, bracing up and improving the condition or tone of its muscular fibre and slowing its action so as to give it increased rest. Digitalis stands first on the list.

1. We see the great benefit of this division, more especially in heart disease, where the pulse is feeble and irregular, and in functional derangement of cardiac action from feebleness of the muscular structures of the heart.

2. Those which act more particularly on the blood-vessels, raising arterial tension by contracting the muscular tissue of which their walls are largely composed. Here again digitalis comes into play, but we also have ergot, belladonna, &c. &c.

2. These also act well in improving the general tone of local circulation, bracing up the vessels, and removing œdema and passive congestion.

3. Those which act directly on the blood, increasing the number of red corpuscles and the amount of hæmoglobin which they contain. Iron, phosphorus, arsenic, small doses of mercuric perchloride, and cod-liver oil have been proved, by careful investigations and by direct measurement, to have this property.

3. In anæmia, where the blood is poor in red corpuscles and hæmoglobin, in chlorosis, in the debility following loss of blood, &c. &c., these hæmatinic remedies, as they have been called, are of essential service, whilst in neuralgia they act well by giving the enfeebled sensory nerves the healthy stimulus of better blood.

III. Digestive Tonics.

Of the importance of this division there can be no doubt, when we consider that life itself, as well as sound health, depends on the consumption and due assimilation of a well-arranged dietary. Bitters are generally looked upon as the type of tonics, and there is no doubt that they increase the feeling of appetite and augment the secretion of saliva, and possibly that of the gastric juice.

Then, again, the best tonic to an irritable stomach may be remedies such as bismuth and hydrocyanic acid, which calm and soothe, and enable the mucous membrane to resume its function. Gentle purgatives may also act as tonics, and acids and alkalies, which both check inordinate acid secretion and encourage its flow.

In general debility and feebleness, convalescence from acute illness, and want of tone, we know how much more hopeful we become when our patient is able to relish and digest his food; and we also know how great is the aid given by small doses of alcohol with the meals, in helping the weak stomach to do its work. For irritable dyspepsia, with a red tongue, the ordinary tonics only do harm; and when the tongue is foul and loaded a mild course of purgatives will remove unhealthy mucus and enable digestion to be satisfactorily accomplished.

MERCURY.

Local Actions.

Physiological.

One preparation, the acid nitrate, is a very powerful

Therapeutical.

The acid nitrate is used as an application in lupoid ulce-

caustic, in virtue of its free nitric acid. Salivation has occasionally followed its use.

Other preparations are occasionally used externally for skin diseases, syphilitic ulcerations, &c., and in virtue of the destructive power which all, but more especially corrosive sublimate, exert over the lowest forms of animal and vegetable life. In virtue of this power corrosive sublimate is now used to carry out the antiseptic process of Lister, and in Germany it has almost entirely superseded carbolic acid for this purpose, the great advantage which it possesses over other agents being its non-volatility. Mercury, being readily absorbed by the skin, is frequently introduced into the system by this channel.

rations, and in ulcerations about the os and cervix uteri.

Calomel dissolved in lime-water, and forming the familiar black wash, is of great service in venereal ulcerations, either primary or secondary; and the same salt, in the form of powder, may be dusted on condylomata or corneal ulcerations with advantage. Corrosive sublimate, in the form of lotion, often checks troublesome ulcerations of the throat; and both this and the various forms of mercurial ointment are almost infallible remedies for pediculi, or for favus, tinea tonsurans, and other skin diseases which are known to depend on the presence of minute vegetable growths. We must remember, however, that dangerous symptoms, and even death, have occasionally been caused by the absorption of the mineral when thus applied.

Many chronic skin diseases may be well treated by citrine ointment. Goitre frequently yields in India to the inunction of the biniodide, and Mr. Marshall has highly recommended the oleate of mercury as an application to various joint affections.

The external application of mercury, by the calomel vapour bath or blue ointment, having for its object the production of constitutional effects, will be considered further on.

Internal Actions and Uses.

1. *Brain and Nervous System.*—Mercury, pushed up to the development of poisonous symptoms, produces a curious condition of nervous debility and tremors, which is occasionally met with in workmen who have been freely exposed to its fumes in silvering glass.

1. Mercury has been found of most signal service in some forms of advanced syphilitic disease affecting the brain.

2. *Circulation and Respiration.*—One form of mercury, the perchloride, or corrosive sublimate, acts as a cardiac poison, distinctly lowering the action of the heart, but the other preparations have no such influence. Mercurial preparations, as a rule, when largely given, cause anæmia by destroying the red corpuscles of the blood, which, first becoming spheroidal and of deeper hue, finally lose their cohesion, and dissolve. The blood becomes more fluid, and the fibrine less coagulable.

2. An exception to this general rule must be noted in secondary syphilis with anæmia, where mercury undoubtedly increases the proportion of the red to the white corpuscles. Mercury has been strongly recommended as removing congestive œdema and promoting the absorption of exudations in some forms of bronchitis.

Corrosive sublimate in small doses, however, acts as a tonic, and increases the number of red corpuscles.

3. *Secreting Organs.* — *Stomach and Intestines.* — Mercurial preparations, and more especially calomel, act as purgatives, causing repeated greyish or greenish evacuations, the duodenum being the portion of the gut primarily acted upon. The action of mercury on the liver has provoked a good deal of controversy.

Calomel and blue pill are frequently used as adjuncts of other purgative drugs.

3. Ringer has shown that the form of vomiting common in children, where the stomach rejects everything suddenly and violently, may readily be cured by $\frac{1}{5}$ gr. of hyd. c. cretâ or $\frac{1}{6}$ gr. of calomel every hour. Minute doses of the perchloride are valuable in the dysenteric diarrhœa of children.

Clinical evidence has most distinctly proved, not only that the well-known symptoms of biliousness may be most effectually removed by the old-fashioned blue pill and black draught, but that an increase of bile may also be thus produced in the motions. This has been explained by the irritating influence of the mercury on the duodenum, and the consequent sweeping away of the secreted bile, which, under ordinary circumstances, is well known to undergo reabsorption from the intestines.

Mercury has been supposed

Kidneys.—Mercury, and more especially blue pill, has the power of promoting the action of diuretics.

Salivary.—Mercury is well known to stimulate the action of the salivary glands, large quantities of their secretion being poured out when the drug is pushed far enough. The fluid, at first thick and containing much albumen, subsequently becomes thin and watery.

Skin.—Inunction of ung. hyd. is apt to bring out a crop of irritable pimples, and one of the symptoms of mercurial poisoning is an eczematous eruption.

Mercury is supposed to stimulate absorption by renalso to act by stimulating the gall-bladder to contract. But the careful experiments of Rutherford have proved that whilst calomel stimulates the intestinal glands, but not the liver, corrosive sublimate is a powerful hepatic, but a feeble intestinal stimulant.

There is no foundation for the belief that calomel acts in consequence of being converted by the gastric juice into corrosive sublimate.

Thus, in the form of the old pill, containing blue pill, squill, and digitalis, we obtain a most marked diuretic effect.

The old-fashioned notion in now happily exploded, that we must measure the efficacy of our mercurial treatment by the amount of salivation, our object being always to stop short at any evidence of increased salivary secretion.

Mercurial applications are useful as stimulants in many chronic skin affections, as well as in pruritus, and in pityriasis of the scalp.

Mercury was accordingly invariably given in former

dering effused fibrine less cohesive, by promoting its disintegration, and by retarding cell growth.

days in all cases where any effusion of fibrine was supposed to have taken place, such as the second stage of pneumonia.

Specific Action.

Mercury may be said to act as a specific, or at least as a true vital antidote, in syphilis, and more especially in the primary and secondary stages of that insidious malady. When we are satisfied that we have to deal with an infecting sore, the sooner we begin our mercurial treatment the better; and it is well to push it in small doses for a considerable time, until the gums are slightly affected. For this purpose moderate doses of blue pill and opium are perhaps the most effectual; but we may also derive much benefit now and then from rubbing in ʒss. to ʒj. of blue ointment night and morning. The whole train, also, of secondary eruptions of the skin, sore throat, condylomata, iritis, &c., must also be subjected to mercurial treatment, and the calomel vapour bath and the bichloride of mercury will here do us good service.

It is doubtful, whether, by the most careful and scientific treatment of a primary sore, we can altogether prevent the development of secondary symptoms; but if we cannot do this we can at least postpone them, render them less severe, and also lessen the probability of tertiary mischief. In order to get the most satisfactory results, we must continue the cautious administration of the drug for many months; and if this be done there is every reason to believe that syphilis may be cured, or finally eradicated from the system.

In the congenital syphilis of young children the local application of a little blue ointment, either rubbed into the skin or smeared over a bit of flannel wound round the waist, is eminently satisfactory in its results.

Mercury was formerly believed to have a specific influence

in checking the inflammations of serous membranes, and was consequently invariably used in peritonitis, pericarditis, and pleurisy; but faith in this conviction has been a good deal shaken of late, and the conventional calomel and opium does not so often appear in prescriptions as formerly.

On the Continent much importance is attached to considerable doses of calomel in the early stages of typhoid fever, but statistics do not seem to prove any decided advantage as accruing from this mode of treatment.

Drawbacks, Mode of Administration, &c.

It is important to be familiar with the signs which indicate when the mercurial treatment has been carried far enough. The gums generally give the first token in a delicate red line running along their margin, followed by pulpy thickening of the interdental portions, and finally retraction from the teeth. To this succeed a metallic taste in the mouth, an increased flow of saliva, and a peculiar fœtor of breath, and we generally find that the very slightest 'touching' of the gums is sufficient to show that the physiological effect of the mineral has been attained.

Whilst a patient is undergoing a mercurial course we must keep up his constitution with good diet, iron, and perhaps a little stimulant; for experience shows that mercury far more speedily exerts its debilitating influence on weak persons or those who are enfeebled by fasting.

We must therefore beware of its use in consumptive or strumous persons, or in those who are suffering from Bright's disease or diabetes, and recollect that idiosyncrasy may here play an important part, and that some persons are much more readily salivated than others, without known cause.

Children, more especially those under the age of two years, are rarely if ever salivated, and only show the influence of the drug by peculiar greenish stools; but in the fortunately exceptional cases of its occurrence it is too often uncontrollable,

and is followed by destructive ulceration, and even gangrene. Another danger pointed out by Mr. Hutchinson being a peculiar malformation of the teeth, due to the incautious use of grey and other so-called 'teething' powders in early life.

Mode of Elimination, &c.

Mercury is eliminated principally by the urine, but also in smaller degree by the saliva and the biliary and intestinal secretions.

Modes of Administration, Dose, &c.

In the treatment of syphilis, mercury may be given by inunction, in which from ʒss. to ʒj. of blue ointment is rubbed into the skin once or twice a day, varying the place of application so as to avoid that cutaneous irritation which may otherwise result. This method, although very effectual, is dirty, and rather liable to cause excessive salivation.

The oleate of mercury, made by dissolving the yellow oxide in oleic acid, and varying according to strength from a clear solution to a resin-like ointment, is a very clean way of using the drug externally, and, in addition to its value in syphilis, may be employed in articular inflammation, simple synovitis, threatening abscess, orchitis, sycosis, &c. (Marshall); and the B. P. have now recognised its merits by introducing the *oleatum hydrargyri* into their new edition.

Fumigation is also extensively employed, but it is only of real service in the cutaneous affections dependent on secondary syphilis, where the actual deposition of the vaporised calomel on the skin produces a beneficial local influence. Twenty grains of calomel are used at each sitting, and are diffused along with watery vapour by a spirit lamp, and brought in contact with the patient, as he sits, covered with a blanket, on a perforated chair, over the fumigating apparatus.

Corrosive sublimate has been used by subcutaneous injection, but in this way it creates great local irritation, hard, black, painful lumps, often running into abscess, being pro-

duced at the site of puncture; and, although much ingenuity has been expended on the search for a harmless solution, no success has yet attended these efforts. This, however, matters the less, because no reliable evidence has been offered to show any advantage in this plan over others, and it is undoubtedly much better to administer it by the mouth, when it is specially useful in chronic skin and throat affections. Some authorities prefer to give it alone, whereas others advise a combination with potassic iodide thus :—

℞ Hydrargyri perchloridi . . .	gr. ss.
Potassii iodidi	ʒss.
Decocti cinchonæ	f. ℥viij.

S. f. ℥j. ter die post cibum.

℞ Hydrargyri perchloridi . . .	gr. ij.
Acidi muriatici diluti	f. ʒij.
Mellis depurati	f. ℥ij.
Aquæ destillatæ	ad f. ℥x.

For antiseptic purposes Lister recommends a combination with albumen in the form of the serum of horse blood. This deprives it of irritating properties.

An excellent gargle for *syphilitic throat ulceration.*

Opinions vary considerably regarding the best form of mercury for internal administration in the treatment of syphilis. Mr. Hutchinson prefers hydrarg. cum cretâ in doses of from gr. iij. to gr. v. two or three times a day. But it is well to remember that this preparation is often uncertain in composition and action, being altered by keeping, and sometimes causing troublesome vomiting and purging. Ricord, on the other hand, advises gr. j.–iij. of the green iodide [but it is ordinarily given in much smaller doses to begin with]; whilst others are content to employ the pil. hydrarg. in gr. j.–iij. doses in pill, keeping its purgative properties in check by a little opium.

℞ Pil. hydrargyri	gr. ij.
Pulveris opii	gr. ¼
Confectionis rosæ	q. s.

ut fiat pilula quartâ quâque horâ sumenda.

[The following is a good formula for the protoiodide :—

℞ Hydrarg. iodidi viridis,
Extracti lactucæ . . . . ãã gr. xlv.
Extracti opii . . . . . gr. xv.
Confectionis rosæ . . . . ʒjss.
In pil. no. lx. dividenda.
S. Dose, 1 to 3 pills a day.]

For purgative purposes the blue pill is generally prescribed in 5-grain doses, taken overnight, and aided by some fluid aperient in the morning.

℞ Hydrarg. subchloride . . . gr. xij.
Mannæ . . . . . gr. vj.
Pulveris tragacanthæ comp. [Br.] gr. vj.
Divide in pilulas sex. Capiat duas pro re nata.

A good purgative formula.

As a diuretic the following is the useful old combination sometimes known as the ' Guy's ' and sometimes as ' Baillie's Pill ' :—

℞ Pilulæ hydrargyri . . . . gr. iij.
Pulveris scillæ . . . . gr. jss.
Pulveris digitalis . . . . gr. ss.
Fiat pilula bis terve die sumenda.

Unguentum hydrargyri nitratis (citrine ointment) is much used as a stimulant and alterative application in chronic skin diseases and ophthalmia. It generally requires to be used in a diluted form, and the B. P. now contains the unguentum hydrargyri nitratis dilutum, containing one part of ointment to two of soft paraffin.

The decoction of Zittmann may be used with great advantage as a gentle diaphoretic and alterative in secondary syphilis, either alone or as an adjuvant to mercurials. It has been also used with advantage in scrofulous conditions of the system, in chronic rheumatism, in skin diseases, and obstinate ulcerative affections. The dose is one wineglassful of each strength several times daily. The formula of the Prussian Pharmacopœia is as follows :—

Decoctum Zittmanni fortius.—Take of sarsaparilla root,

cut, 100 parts ; digest in water 2,600 parts for 24 hours ; and add, inclosed in a linen bag, powdered sugar and alum, each 6 parts, calomel 4 parts, and cinnabar 1 part ; then heat in a covered vessel placed in a steam-bath for three hours, stirring frequently, and, near the end of the boiling, add anise and fennel, bruised, each 4 parts, senna, cut, 12 parts, and liquorice-root, cut, 12 parts. Express, strain, set aside for some time, and decant to obtain 2,500 parts of clear liquid : 2,500 grammes of this are to be divided into 8 parts.

Decoctum Zittmanni mitius.—Take the residue left from the preceding and 50 parts of sarsaparilla ; heat with water, 2,600 parts, for three hours, in a covered vessel placed on a steam-bath, stirring frequently, and when near the end of the boiling add lemon-peel, cinnamon, cassia, cardamom, and liquorice-root, each, cut and bruised, 3 parts. Express and operate as before to obtain 2,500 parts.

Mercury was detected by Wiggers in this decoction in very small proportion. It should not be prepared in metallic vessels, lest the mercurial in solution should be decomposed.

LITHIUM.

General Physiological Effects.

Lithia forms a very soluble salt with uric acid, probably in the blood, and therefore prevents the deposition of chalky formations in the tissues.

It also causes an increase in the urinary secretion.

Therapeutical.

Lithia is therefore a valuable remedy for gout and uric acid gravel, given either in the form of effervescing lithia water, lithii carbonas 3 to 6 grs., lithii citras 5 to 10 grs., or the benzoate, which is Garrod's favourite preparation, in 5 to 15 gr. doses.

It therefore acts as a diuretic perhaps more powerfully than any of the other alkaline salts.

MAGNESIUM AND ITS PREPARATIONS.

General Physiological Effects.

Magnesia and its carbonate have a great capacity for saturating and neutralising acid, and, secondly, on becoming converted into bicarbonate by the carbonic acid of the intestines, they produce a mildly laxative effect.

Sulphate of magnesium acts much more powerfully, and causes profuse watery evacuations, and its action may be thus explained:—

In virtue of its low diffusive power it does not readily find its way into the blood, but, remaining in the intestines, it attracts and firmly retains the watery fluid it finds there, and thus prevents its reabsorption. But, in addition to this, recent experiment has shown that it also actually withdraws fluid from the veins, as proved by the rapid way in which a small portion of intestine isolated from the rest of the tube becomes filled with watery fluid after the introduction of sulphate of magnesium.

Therapeutical.

They are therefore antacid, and relieve pain or heartburn, and are also gentle purgatives much used, more especially for children. Their tendency, however, to form concretions when employed too long limits their use in this respect.

Sulphate of magnesium is a very commonly used purgative in doses of from ʒj. to ℥ss. in simple constipation, in the early stages of small-pox and feverish conditions, in chronic lead-poisoning, and, combined with iron, in many atonic conditions of the system.

It has been credited with cholagogue properties, but Rutherford has shown, on the contrary, that it actually lessens the hepatic secretion. The principal mineral waters containing this salt are Birnenstorf in Switzerland, Pullna in Bohemia, Seidlitz and Friedrichshall in Saxony.

That this is not entirely due to exosmosis is rendered probable by the fact that the blood contains a greater proportion of saline matter than many mineral waters, besides which we know that albuminous or colloidal solutions like serum dialyse with difficulty, so that the exosmosis ought in reality to be from the intestine towards the blood. The experiments of Rutherford have shown that mag. sulph. is a powerful stimulant to the intestinal glands; an action which may be at once checked by paralysing the sensibility of the gut by a little laudanum.

Mode of Administration.

As sulphate of magnesium is not only very nauseous, but, when taken alone, may cause griping, straining, or uncomfortable abdominal distension, it is usually prescribed in combination with senna, cardamoms, and liquorice, as in the mist. sennæ co., or with a little acid and sulphate of iron, both of which seem to increase its purgative properties; and it is well to remember that free dilution also seems to enhance its effects. The following are good formulæ:—

℞ Magnesii sulphatis ℥ij.; syrupi zingiberis ℥ss.; infusi rosæ acidi ad ℥viij. ℥j. tertiis horis.

℞ Magnesii sulphatis ℥ij.; ferri sulphatis gr. xxiv.; acidi sulphurici diluti ʒij.; infusi quassiæ ad ℥viij. Misce, fiat mistura, cujus capiat unciam unam omni mane.

℞ Magnesii sulphatis ℥ij. : magnesii carbonatis ʒij. ; syrupi zingiberis ℥j. ; aquæ menthæ piperitæ ad ℥viij. Misce, fiat mistura. Sumat unciam unam quartis horis ad effectum, phialâ priùs bene agitatâ.

LEAD.

Local Action.

Physiological.

The external action of lead is partly sedative and partly astringent.

Therapeutical.

Lead in the form of subacetate is much used as a lotion for erysipelas, acute eczema, and various ulcerative conditions.

It forms a good collyrium in the more superficial inflammations of the eye ; but we must remember that its tendency to deposition may cause a permanent white patch in corneal ulcers.

The powder of nitrate of lead has been shown to be a good application in onychia maligna.

Internal Actions and Uses.

1. *Brain and Nervous System.*—When lead is given in poisonous doses a curious train of nervous symptoms show themselves, beginning with violent neuralgic pains and giddiness, and running on into delirium, with epilepti-

form convulsions, and subsequent melancholia. Sclerosis of the areolar tissue, with diminution of the nervous elements, has been found in certain of the sympathetic ganglia, but more especially the cœliac and cervical ganglia. Atrophy of the optic nerve is an occasional though rare complication of lead poisoning.

2. *Heart and Circulation.*—During the action of lead the heart becomes slow, and the pulse smaller and harder, indicating a condition of contraction and tension of the arterial system; and this is by some supposed to be due to a primary effect on the sympathetic, whilst others hold that lead has a direct influence over unstriped muscular fibre, and most powerfully over that which encircles the arteries. Lead tends to produce pallor by destroying the red blood corpuscles.

3. *Intestinal Tract.* — A prominent symptom of chronic lead poisoning is obstinate constipation, depending probably on contraction of the small intestine, and associated with violent colicky pain around

2. This contractile influence of lead over the smaller vessels explains its action in internal hæmorrhage, as we know that hæmoptysis, more especially, may be very successfully treated by acetate of lead in doses of from $\frac{1}{2}$ gr. to 3 gr.

3. Acetate of lead is an excellent astringent in diarrhœa, more especially that of phthisis, and British cholera.

Dr. Thorowgood has obtained good results from lead

the umbilicus. The appetite at the same time becomes bad, the tongue loaded, and nausea and even vomiting are observed. Gastro-enteritis is generally one of the symptoms of acute poisoning.

Urinary System. — Lead has the curious property of obstructing the elimination of uric acid from the kidneys through the blood, and may thus cause gout in painters and others who are exposed to the effect of the metal.

Muscular. — Lead causes violent pains in the muscles, with a peculiar form of paralysis affecting the extensors of the fore-arms, and causing the well-known wrist-drop; and *post mortem* we find fatty degeneration of the muscular structures.

The contracting power of lead over unstriped muscular fibre probably explains the tendency to abortion noted during its poisonous influence.

Poisonous Effects. — The first sign of chronic lead poisoning is a bluish line running along the free margin of the gum, composed of minute dots, and depending on the actual deposition of lead in the mu- in obstinate obstruction of the bowels.

Antidotes.—In poisoning by lead we must give sulphate of magnesium, iodide of potassium, sulphur baths, and remove its after-effects by galvanism of the paralysed muscles; but it is stated that

cous membrane. To this succeed colic, wrist-drop, and the other symptoms mentioned above, the *post-mortem* disclosing chronic catarrh of the stomach and intestines, with the deposition of the metal in the bones, liver, kidneys, brain, nervous and muscular tissues.

Chronic lead poisoning has occasionally resulted from adulterated cider or from water, and indeed in a variety of ways, but is most common in painters, who are brought much in contact with the carbonate in the practice of their business.

sulphuric acid lemonade and a liberal indulgence in fatty articles of diet may act in some degree as prophylactics. Common salt is said to be a good antidote, because lead is eliminated from the kidneys as a chloride.

Mode of Elimination.

Lead is thrown out of the system by the urine, skin, bowels, and milk.

Mode of Administration, &c.

If we wish to administer lead internally we generally prescribe either the acetate or the pil. plumbi c. opio (1 gr. of opium in 8), dose 4 to 8 gr.

Externally we find the liquor plumbi subacetatis dilutus he most convenient form, but the glycerole and oleate are also good preparations, and the British Pharmacopœia has lately added the glycerinum plumbi subacetatis to the list.

POTASH.

Local Actions.

Physiological.

Caustic potash is a most powerful escharotic, withdrawing water from the tissues, and thus destroying them. It has, however, the disadvantage of being very deliquescent, and this tendency to spread beyond the part we wish to attack has led to its practical abandonment as a local application.

The permanganate of potassium, or Condy's fluid, oxidises and destroys many organic substances.

Therapeutical.

Caustic potash, either in sticks or combined with lime in the form of potassa c. calce, was formerly used in the treatment of various forms of ulceration and for the production of issues, which barbarous relics of antiquity are now fortunately discarded from practice. Liquor potassæ has been recommended to soften the great toe-nail and facilitate its removal when ingrowing; and the bicarbonate of potassium forms a good lotion in acute eczema, as an injection in leucorrhœa, and as an application to rheumatic joints.

It is therefore antiseptic, and a good application to unhealthy ulcerations.

Internal Actions and Uses.

Physiological.

1. *Brain and Nervous System.*—Potassium salts, and most especially the nitrate, when given in large doses, exert a paralysing action on

Therapeutical.

the spinal cord, producing great muscular weakness and final abolition of reflex sensibility.

2. *Heart and Circulation.*—Moderate doses of the nitrate raise the arterial tension and slow the heart's action, and if the drug is further pushed the pulsations become weaker, still slower, and finally irregular, before the total arrest of movement supervenes. Coagulation of the fibrine is prevented, and the red corpuscles are restrained in their functions of oxygenation. Chlorate of potassium in large doses (gr. cl. in 24 hours) causes vomiting, hæmatemesis, delirium, icterus, and coma, the urine being of a chocolate colour, and full of disintegrated blood corpuscles.

Potassium salts cause the blood, and secondarily the urine, to become alkaline, and any excess of uric acid may thus become neutralised. These salts are of great importance for the nutrition of the muscles and the blood corpuscles.

3. *Intestinal Tract.*—Chlorate of potassium mode-

2. This has been supposed to explain the beneficial action of potash in acute rheumatism, which is held to depend on an excess of uric acid. Much controversy has taken place with reference to the alkaline treatment of this disease, but I am decidedly of opinion that if large doses of bicarbonate of potassium do not shorten its duration, they relieve symptoms, and lessen the tendency to cardiac complications. Potash acts well also in gout and chronic rheumatism by forming a soluble salt with uric acid.

3. Chlorate of potassium, in doses of from 5 to 20 grains,

rates excessive action of the salivary glands, and assists the healing of ulceration about the gums, mouth, and throat. The potassium salts generally neutralise free acid in the stomach and intestines, and the nitrate in full doses may cause death by gastro-enteritis. Most of the potassium salts are slightly purgative, but only the acid tartrate has any very decided action of this kind, causing as it does the abstraction of a large quantity of watery fluid, without, however, stimulating the peristaltic movement of the intestines. The sulphate is also aperient in its action.

4. *On Secreting Organs.*—It will be remembered that, in speaking of acids, we referred to a law which has been more especially developed by Ringer, and which explains their power of checking acid secretions. Alkalies have precisely the opposite effect, arresting the activity of glands furnishing alkaline fluids, whilst they directly stimulate those whose secretion partakes of the opposite character.

is an admirable remedy in mercurial salivation, in various aphthous conditions, and in sore throat, whether produced by scarlet fever or ordinary tonsillar inflammation, and a wash or gargle may well be combined with its internal administration.

In doses of from 120 to 300 grains, cream of tartar is a good purgative, but is principally used in combination with jalap, which, by stimulating the muscular movements of the small intestines, prevents the probable reabsorption of the watery fluid.

4. We can therefore readily explain, on physiological principles, why alkalies are so useful in hepatic congestion, why they may also stimulate the pancreatic secretion, and why their action is so beneficial in cases of dyspepsia depending on deficient supplies of gastric juice. On these principles, also, we may readily understand the very striking power possessed by a weak solution of potash in arresting the alkaline secretion so freely poured out by the skin in acute eczema.

Kidneys. — Most of the potassium salts, but more especially the acetate, nitrate, citrate, and acid tartrate, are diuretic, and the acetate, bicarbonate, and citrate being converted into carbonate, speedily render the urine alkaline. Elaborate experiments have been made on the more precise alterations effected in the urine by the potassium salts. Prof. Parkes tells us that liquor potassæ increases the destructive metamorphosis of the nitrogenous tissues, and their elimination as urea, as well as that of the sulphur in the form of sulphates. The acetate has been shown to diminish the water, urea, and earthy salts; whereas the citrate, according to Dr. Nunneley, increases the water, but diminishes the urea and solids.

Potassium salts are therefore good diuretics in heart disease, chronic kidney affections, and various dropsical accumulations; and their action is much more marked under these conditions than when administered to healthy subjects, since we have seen that the acetate, which is perhaps the most active of the diuretic group, may even check the elimination of water from the kidneys during health. Dr. Roberts, of Manchester, has proposed to dissolve uric acid calculi by keeping the urine alkaline for months with citrate of potassium.

Potash may be used under other conditions. Thus in asthma and bronchitis the inhalation of the fumes from thick burnt blotting-paper soaked in a strong solution of nitrate of potassium is often effectual; dissolving ʒiv. in a pint of boiling water, soaking the paper thoroughly, and when it is dry cutting into four-inch squares, which may be freely used, as failure often results from too cautious administration and from the paper being too thin. Brushing the surface of the paper over

with tinct. benzoini and a combination of the nitrate with the chlorate of potassium has been recommended, and the addition of a little iodide of potassium is sometimes an improvement. Chlorate of potassium is a useful ingredient in a cough linctus; the citrate is an agreeable febrifuge, and is valuable in many of the feverish and dyspeptic affections of children.

Scurvy is held by some to be dependent on a deficiency of potassium salts in the blood.

Poisonous Action.—Partly from depression of the heart, and partly from inflammation of stomach and intestines.

Antidotes.—Vinegar and lemon-juice.

Mode of Elimination.

The potassium salts, having a high diffusive power, pass readily into the blood, and are given out by the urine, in which the nitrate, chlorate, and sulphate reappear unchanged.

℞ Liquoris potassæ ʒij.; tincturæ calumbæ ʒij.; infusi calumbæ ℥vj. Misce, fiat mist. ℥j. ter in die. Antacid mixture.

℞ Potassii bicarbonatis ʒj.; potassii acetatis gr. xv.; potassii nitratis gr. x.; aquæ ℥ij. Misce, fiat haustus quartis horis sumend. This constitutes the 'full alkaline' treatment recommended by Dickinson for acute rheumatism, and may be prescribed in effervescence.

℞ Potassii chloratis ʒj.; aquæ ℥vj. ℥j. ter die. In ulcerated mouth or gums, or mercurial salivation.

℞ Potassii bicarbonatis ʒss.; aquæ Oj. A good lotion in acute eczema.

℞ Potassii acetatis ʒjss.; aceti scillæ ʒiv.; decocti scoparii ad ℥vj. Misce, fiat mist. ℥j. quartis horis. Diuretic mixture.

℞ Spiritûs ætheris nitrosi ʒij.; potassii nitratis gr. xx.; decocti scoparii ℥iv. Misce, fiat mist. ℥j. ter die. Diuretic.

℞ Potassii tartratis acidæ ʒiij.; succi scoparii ʒvj.; aquaæ ad ℥vj. ℥j. ter die. Diuretic.

℞ Potassii chloratis gr. xxxx.; glycerini ℥ss.; morphinæ hydrochloratis gr. jss.; syrupi ad ℥iv. ʒj. prout res poscit. Dr. Douglas Powell's linctus for the chronic throat irritation of consumptive patients.

The cyanide of potassium is now included in the B. P.

DIURETICS.

Diuretics stimulate and increase the flow of watery fluid through the kidneys in various ways, which we may conveniently classify under the following headings:—

Physiological.

1. Stimulating diuretics, which act by directly exciting or irritating the glandular secreting structures of the kidney.

2. Those drugs which stimulate the circulation, called by Gubler vaso-motor diuretics, causing increased arterial tension, and thus greater pressure on the walls of the Malpighian bodies, by which means transudation of watery fluid is mechanically favoured.

Therapeutical.

1. These are cantharides, turpentine, colchicum, squill, nitrate of potassium, &c., and they are rarely used, as they are liable to produce pain, strangury, and even hæmorrhage. Cantharides has, however, been recommended in some forms of chronic albuminuria and in pyelitis.

2. The principal of these are digitalis, belladonna, squill, and ergot; and they are of service in various dropsies, and perhaps most especially in those which depend on disease of the heart.

3. We next come to the saline diuretics, which, in addition to some slightly stimulating influence, have a special power of absorbing and holding watery fluids, which they then carry with them in their exit from the body.

4. Mechanical diuretics must next be included in the list; and among the principal of these we may mention water, which acts by washing the urinary tubules clear from epithelium or casts which block them under certain conditions, and so allowing secretion to be re-established. Under this heading we may also group those remedial means which act indirectly by relieving the kidneys in various ways. Thus, when congestion is present, local bleeding, dry cupping, warm fomentation, &c., may be the best diuretics. When the kidneys are pressed upon by ascitic fluid, a renewal of their full function frequently follows the operation of tapping, and in many cases we may give these organs temporary rest by handing some part of their duties over to the skin or the bowels.

3. In this group we include the lithium, potassium, and sodium salts; and most of them possess a double action, being diuretic in small, and purgative in large doses. They are also used with advantage in anasarca and dropsical accumulations.

4. Dr. Dickinson has shown how well copious draughts of water act in the acute desquamative nephritis of children, on the mere mechanical principle of sluicing or washing out the obstructed tubules. The indirect diuretics are often of most service in renal disease, and Christison, Gairdner, and other good authorities have always upheld the benefits to be derived from the treatment of Bright's disease in all its stages by the less stimulating forms of diuretics. A good way of promoting the absorption of fluid effusions, and of largely increasing the urinary flow, is by placing the patient on a very dry diet, and cutting off as far as possible the supplies of fluid.

Diuretics are notoriously uncertain remedies, and many of them have not the slightest power of increasing the flow of urinary water during health. They also vary much in their power of promoting the elimination of urea and other products of excretion by the kidneys. They may be given either by the mouth or by vapour, in which way oil of juniper acts well; or, as in the case of digitalis, they may be efficiently used by cutaneous absorption. In their administration we must observe the following rules. Give them freely diluted, and, as a rule, combined with one another, several remedies of the class seeming to act better than one, as in the famous Guy's pill. Keep the patient cool, so as to avoid any action on the skin, and endeavour to prevent the bowels from coming too freely into play.

SODA.

The sodium salts have none of the depressing action on the heart which we have seen to be possessed by potash.

Locally we may use soda in acute eczema, as the hyposulphite in parasitic skin disease, where it acts in virtue of the contained sulphurous acid, and as the biborate, or borax, as a gargle, a lotion in pruritus and various skin diseases, and as an application to ulcerations about the mouth. A saturated solution of carbonate of sodium is said to be a very soothing application to burns and scalds. The internal use of borax occasionally causes an eruption of psoriasis, curable by arsenic.

Soda is not so much used internally as a remedy for gout and rheumatism, because the urate of sodium is less soluble than the urate of potassium; but it is one of our best remedies in those forms of dyspepsia with pain after food, weight at the stomach, red fissured tongue, cough, palpitation, &c. The hyposulphite is useful in sarcinous vomiting, and some physicians have faith in the hypophosphite as a nervine tonic. Dose, 5 to 10 grains. Sodii sulphis, gr. x. ad xv.

Chloride of sodium is a good emetic; the phosphate and

tartrate are purgative, and none of the preparations appear to be decidedly diuretic in their action. Sodium phosphate was found by Rutherford to be a powerful stimulant of the liver, whilst sodium sulphate possessed the same action in a less degree.

℞ Sodæ tartaratæ ʒij.; sodii bicarbonatis ℈ij. Misce, ut fiat haustus effervescens cum acidi tartarici gr. xxxvij. et aquæ ʒiv. Seidlitz powder.

℞ Sodii bicarbonatis gr. xx.; tinct. calumbæ ♏xx.; syrupi zingiberis fl. ʒss.; infusi gentianæ compositi ad fl. ℥j. Misce, ter die sumend. Useful draught in dyspepsia.

ZINC.

Local Actions.

Physiological.

Chloride of zinc is an exceedingly powerful caustic, and in weak solution has astringent properties. The sulphate and oxide are also astringent in varying proportions.

Therapeutical.

Chloride of zinc has been used as a caustic for the treatment of cancerous and other ulcerations, either in strong solution, substance, or arrow-shaped masses made with flour and inserted into incisions around the base of the morbid mass. It has turned out to be the principal ingredient in all so-called cancer curers' nostrums, and is employed in legitimate surgery as an application to wounds from which cancerous growths have been removed, and also in the strength of gr. lx. ad ℥j. to the raw surface after ordinary operations, with the view of preventing pyæmia.

It makes an excellent injection in gonorrhœa. Sulphate of zinc is a much-valued astringent lotion in conjunctivitis and leucorrhœa; and the oxide, either in powder or ointment, is one of the most useful applications in chronic skin diseases. The oleate of zinc forms an excellent application in acute eczema.

Internal Actions and Uses.

Physiological.

1. *Action on Nervous System.*—This is probably tonic in character, and some astringent properties may also be noted.

2. *On Digestive System.*—Sulphate of zinc promptly and effectually empties the stomach, without causing much depression or nausea.

Therapeutical.

1. We can thus explain the benefit which sometimes results from the use of sulphate of zinc in chorea. We here begin with a grain, and continue in gradually increasing doses up to 6 or 8 grains, tolerance being rapidly established, and the emetic action of the drug avoided. Oxide of zinc, in doses of from 1 to 5 grains, is an excellent remedy in the night sweats of phthisis, and it is also a valuable aid to treatment in the diarrhœa of children.

2. It is therefore our most reliable direct emetic, invaluable in cases of poisoning, &c., in doses of from 20 to 30 grains.

℞ Zinci sulphatis gr. xxx.; aquæ ℥iij. Misce, fiat haustus emeticus statim sumendus.

℞ Zinci chloridi gr. j.; aquæ rosæ ℥iv. A good injection in gonorrhœa.

℞ Zinci oxidi ʒij.; glycerini ʒij.; liq. plumbi subacet. ʒjss.; aquæ calcis ad ℥vj. Misce, fiat lotio. Useful in impetigo.

℞ Zinci valerianatis gr. xxiv.; confectionis rosæ caninæ quantum sufficit ut fiat massa in pilulas duodecim dividenda. Deaurentur pilulæ. Nervine tonic.

Three new zinc preparations have been added to the B. P.: Zinci sulphocarbolas, calamina præparata, and oleatum zinci. The permanganate and the sulphocarbolate of zinc make good injections in gonorrhœa.

EMETICS.

The object of an emetic is to stimulate the so-called vomiting centre in the medulla oblongata, close to the origin of the pneumogastric nerve, and induce it to call forth the complicated series of muscular acts which terminates in evacuation of the stomach. Emetics act in two ways, and are thus classed as—

Direct.

When the drug irritates the filaments of the pneumogastric nerve distributed to the mucous membrane of the stomach, and this irritation being transmitted to the centre is reflected in motor impulses through the pneumogastric, phrenic, and intercostal nerves. The direct

Indirect.

Emetics of this class are conveyed directly by the medium of the blood to the vomiting centre, and act well by injection without coming into contact with the stomach. They are less prompt and more depressing than those of the other class. Principal members: Ipecacuanha, tartarised

emetics are prompt in their action, and cause little nausea and depression; and the principal members are sulphate of zinc, sulphate of copper, carbonate of ammonium, mustard, common salt, &c.

antimony, apomorphia, veratria, delphinia, &c.

The reflex chain then being established by which the muscular apparatus causes vomiting, we must next consider the various steps of the process.

Physiology of Vomiting.

1. In the first place the cardiac sphincter must be relaxed, or no vomiting can take place, and the persistent contraction of this structure may account for many cases of distressing retching.

2. The actual contraction of the walls of the stomach itself must be supplemented by that of the abdominal parietes.

3. The diaphragm descends and becomes fixed.

4. The glottis is closed, so that the various muscles compressing the stomach act between two fixed points.

5. As vomiting cannot be effectually accomplished if the stomach is quite empty, under these circumstances the patient generally swallows a

Therapeutics.

Emetics are used to empty the stomach in cases of poisoning, and here we invariably employ the direct class, such as sulphate of zinc, mustard, salt, &c. If the patient be unable to swallow, we may attain our object by the subcutaneous injection of apomorphia. They are also of service in some forms of dyspepsia and to clear the stomach in intoxication, and for the relief of the convulsions of infancy, which often depend on irritating articles of diet. The regular use of the stomach-pump at stated intervals has proved useful in cases of dilated stomach with sarcinous vomiting and serious digestive derangement.

certain quantity of air, so as to distend the viscus.

1. *Action on Brain and Nervous System.* — Emetics may cause some congestion of the brain by the obstructed venous return from the neck during the act of vomiting.

1. We must therefore avoid their use in apoplectic cases.

2. *Circulation and Respiration.*—They have a sedative action on the heart.

As the respiratory is close to the vomiting centre, the breathing generally becomes sighing and irregular during the act of vomiting; but in addition to this there is an increase of secretion from the pulmonary mucous membrane, and the compression of the lungs forces retained mucus out of the bronchial tubes.

2. Emetics are of great service in clearing the lungs in bronchitis, and in getting rid of the false membrane in croup and diphtheria, and they may thus be said to act as expectorants. We had here best use such emetics as ipecacuanha and tartarised antimony, which combine an expectorant action.

3. *Organs of Secretion.*— By the pressure exerted on the intestines, some slight purgative action may result, and prolonged vomiting always leads to the discharge of bile from the stomach by the mechanical squeezing of the liver and gall-bladder.

3. Emetics may therefore be said to act as cholagogues, and may be of great service in stimulating the action of the liver, and removing inspissated secretions from the gall-bladder. Some authorities hold that it is good practice to give an emetic as early as possible at the outset of fevers, such as enteric; and it has been suggested that the fever poison is retained at this stage in the bile, and may be ex-

Cutaneous.—Emetics invariably cause free perspiration during their action, as well as an increased flow of saliva.

pelled along with it from the system.

ALCOHOL.

Alcohol amylicum used to prepare the nitrite of amyl and the valerianate of sodium.

Alcohol Ethylicum (absolute alcohol) used in the preparation of chloroform and the ethylate of sodium.

Local Actions.

Physiological.

Alcohol has some external astringent properties from its power of hardening albumen and thus condensing the tissues, whilst from its rapid evaporation it produces a cooling effect.

Therapeutical.

This hardening process has been turned to practical account for the prevention of bedsores, and alcohol is also a usual ingredient in the now somewhat old-fashioned spirit or evaporating lotions.

Internal Actions and Uses.

1. *On Brain and Nervous System.* — Alcohol primarily stimulates the cerebral centres by dilating their arteries, and so admitting more blood; secondly, excitement supervenes with impaired muscular co-ordination, and finally coma, which may prove fatal if the dose taken be sufficiently large. Whilst it may also in small doses stimulate the spinal cord, in larger quantities it undoubtedly weakens

1. A moderate quantity of alcohol stimulates the mental faculties, whilst larger doses become narcotic and even anæsthetic. In chronic nerve debility, as neuralgia, we may often relieve pain by the use of stimulants; but these are precisely the class of cases in which habits of intemperance are most readily formed.

Nothing seems better proved than the fact that alcohol lessens the capacity for

the functions of that structure, causing indisposition for active exertion, as well as actual want of power. This has been proved by the experience of campaigns, but more especially that in Ashantee, where it was found that alcohol distinctly diminished the power of bearing fatigue, and also by the experiments of Parkes, which showed most conclusively that 2 or 3 ounce doses of spirits, given several times per diem to a couple of healthy men engaged in laborious work, caused a slight primary increase of energy, but a secondary well-marked indisposition for muscular exertion, with actual diminution of bodily vigour. Dr. Wilks has also drawn attention to a remarkable series of cases in which paraplegia, with numbness, anæsthesia, and violent shooting pains, have been caused by the excessive and long-continued use of alcohol.

On the sympathetic system the effects are somewhat varied; for although the dilatation of certain vascular areas must depend on paralysis of these nerves, there seems no doubt that, as Binz has shown, active muscular exertion, and it is therefore well to advise sportsmen, soldiers, and others who are about to undergo severe bodily fatigue, to reserve all stimulant until their day's work is over, when it may be of real service. In the Ashantee campaign a ration of rum on reaching camp at night seemed to revive the men after their labours.

In those cases of chronic alcoholic poisoning described by Wilks, we must follow his advice, and entirely cut off all supplies of strong drink.

alcohol in inflammatory conditions stimulates the sympathetic, contracts the arterioles, and prevents that migration of the white corpuscles which constitutes the essence of this morbid process. The chronic abuse of alcohol causes nervous tremors and debility, gradually leading up to that semi-maniacal state known as delirium tremens, in which the victim is haunted by the constant presence of spectral illusions, preventing sleep, and finally wearing him out if unchecked. The brain, like most of the internal organs of the body, suffers in alcoholism from the contraction of new areolar tissue pressing upon and obliterating some of the nervous elements.

2. *On Heart and Circulation.*—Alcohol in moderate doses has a stimulating influence on the heart, and dilatation of the peripheral vessels and of those of the brain is produced.

In chronic alcoholism we find a degenerated condition of the larger vessels, known as atheroma, and valvular disease of the heart and aneurism are therefore frequently met with.

This is, no doubt, one explanation of the beneficial action of alcohol in some cases of acute inflammation.

The treatment of delirium tremens consists most essentially in withholding all stimulant, in keeping the patient in a cool, quiet, dark room, in forcing him to take small and oft-repeated supplies of nourishment, and in cautiously prescribing narcotics, of which chloral hydrate is the best.

2. To its action on the circulation, however, we must ascribe a good deal of the beneficial influence of alcohol in the treatment of disease. When the powers of life show signs of failing, when the first sound of the heart grows weak, the pulse feeble, compressible, and irregular, when syncope threatens, and delirium is beginning, the indications for the administration of alcohol are

complete, and it will be found to act well when the tongue moistens, the pulse gains in volume and regularity, sound refreshing sleep is obtained, and the temperature falls. It is, of course, difficult to lay down exact rules as to the precise stage of fevers at which we may best prescribe alcohol, but ordinarily we should do so in typhus about the seventh day, in typhoid the twelfth, in small-pox when the secondary fever is developed, and in acute inflammations generally when the heart begins to fail and the nervous system to show indications of debility.

3. *Respiration and Temperature.*—The old observations of Liebig seemed to show that alcohol was a respiratory food, and was largely burnt off in the lungs, thus aiding in the production of animal heat. It is now found, however, that partly, at least, under its use the carbonic acid given off from the lungs is diminished from its retention in the lungs, and that the body heat is lowered. When but small doses are taken, only a slight cooling effect is produced, whilst large quantities may reduce the

3. This lowering of temperature must also be explained by diminished tissue metamorphosis, by radiation of heat from the dilated vessels of the skin, by a partial arrest of the oxygen-bearing function of the red corpuscles of the blood, as well as by the paralysing influence of the alcohol on the protoplasm of the heat-producing cells, as illustrated by the way in which it checks the action of yeast (Binz).

That some of this action is chemical is proved by the fact that alcohol lowers post-mor-

temperature by two or three degrees, the explanation being partly that the dilatation of the cutaneous vessels enables more blood to be removed from the heat-producing centres, spread out and cooled in the wide sheet of the superficial circulation, and then returned to abstract more warmth from the internal organs. Another curious fact is that alcohol also diminishes the power of resistance to cold; and this has been proved not only by the experience of Arctic voyagers, but by the following experiment:—If we place two animals, one of which has been dosed with alcohol, in a chamber of which the temperature has been reduced to 10° below freezing-point, both will speedily be benumbed to sleep; but whilst the healthy animal will be supported by the combustion of its tissues and survive the shock, its companion will perish from this heat-producing process being interfered with by the spirit.

4. *Intestinal Tract.* — In small doses alcohol stimulates the appetite and increases the supply of gastric juice; but if given in large quantities this

tem temperature. It is therefore evident that we must warn persons about to be exposed to severe cold of the fallacious nature of the old notion that alcohol furnishes true warmth.

There can, however, be no doubt that we may often alleviate the evil effects of a chill by a dose of spirit, which releases the capillaries of the skin from their state of morbid contraction, and thus prevents congestion of internal organs. As an antipyretic, alcohol can hardly be used with safety, as at least two ounces of absolute alcohol are required to lower the temperature of an adult.

4. Alcohol is often beneficial in the case of weakly persons, and more especially at the extremes of life, by giving tone to the digestive organs

secretion is checked, nausea is produced, and the desire for food disappears. In the advanced stages of chronic alcoholism the stomach is injured by the contraction of the new areolar tissue obliterating its glands, and hence we find dyspepsia with morning vomiting a very common symptom in drunkards.

and aiding the due assimilation of food. Although its use is by no means essential to the healthy, it is of great service to dwellers in large towns, and others whose mode of life involves much mental strain. We must invariably lay down the rule that, save in illness, alcohol should never be taken on an empty stomach, that the freer dilution in which it is imbibed the better, and that 2 ounces per diem should be about the limit of quantity. Although some persons seem to get on better without anything stronger than water, others are as undoubtedly benefited by a moderate allowance, and the present state of science does not allow us to give dogmatic opinions on the general questions involved, without the careful study of individual constitutions.

Binz values alcohol as a food in fevers, acting not by directly building up the tissues, but as a readily burning fuel, from whose combustion in often-repeated small doses the heat required to generate vital energy may be derived, sparing the reserve of fat in the body and producing force.

Frankland puts down the force-producing power of alcohol as 7 to coal 8, but we must not forget the limited power of the system to draw upon and utilise this fuel.

5. *Secreting Organs.*—Alcohol stimulates the liver, and this organ is one of the first to suffer from chronic abuse of stimulant, the areolar tissues being irritated and an increased formation taking place, which gives a primary enlargement to the organ. These newly formed structures, however, having the tendency to shrink or contract, gradually obliterate the true secreting elements of the gland, which grows smaller and harder, ascites eventually following from pressure on the portal vein and obstructed return of blood from the abdominal circulation. Wine appears to retard salivary digestion.

5. Rutherford found that pure alcohol had no effect on the biliary secretion.

The inhibitory influence of wines on starch digestion is caused by their acidity, and may be neutralised by the addition of an alkali.

Kidneys.—Alcohol has no specially well-marked effect on the urinary secretion, but the kidneys may also suffer from the cirrhotic degeneration just described.

Chronic kidney disease is therefore a very common symptom in the victims of intemperance.

Mode of Elimination.

Alcohol very rapidly enters the blood, and is rapidly given out, in small parts at least, by the breath, but it probably 'undergoes combustion to a great degree in the body, maintains or increases the body weight, and prolongs life on an insufficient diet. It is therefore entitled to be reckoned as a food' (Brunton). Much discussion has been expended on its elimination or otherwise, and some years ago the hopes of temperance agitators were much raised by the apparent result of experiments put forward by two French observers, which seemed to prove that all the ingested alcohol is given out unchanged in the urinary secretion. Anstie and Dupré, however, showed the fallacy of this by pointing out that even the urine of the most rigid abstainers contains a substance which cannot, by the chromic acid test, be distinguished from alcohol; and it has since been asserted that this may actually be alcohol derived from converted liver sugar. Opinions differ much as to the ultimate destination of alcohol in the system. Some hold that it is converted in the blood into aldehyde, then acetic acid, and finally carbonic acid and water. Wanklyn holds that it may be converted, partly at least, by oxidation, into glycol.

Binz believes it to be completely destroyed in the organism, as under the most favourable conditions he has never found more than 3 per cent. in the urine, and as, according to him, no secondary product has ever been found.

As regards the dose of alcohol, it is manifestly impossible to lay down any hard and fast rules, as we must of necessity be guided by the constitution of the patient and the symptoms of his special case. As a rule we may say that about 8 oz. of brandy may be sufficient in typhus or any acute illness, and that 16 oz. may be looked upon as the quantity which it is well not to exceed. In a state of health 2 oz. of absolute alcohol per diem is usually considered a maximum allowance,

every care being taken to ensure purity. The adulteration with fusel oil causes headache and much digestive derangement, whilst picroxine, which is occasionally added to beer, will produce epileptiform seizures.

It is of some importance to consider the forms of alcohol best adapted for varying cases, and we may say, generally, that champagne acts well in sudden and rapid sinking, whilst good whisky or brandy may be recommended in ordinary acute illness. Port and madeira are well suited for cases of debility, and in convalescence from acute illness and digestive feebleness malt liquors and burgundy will often be found to be of great service; but we must always beware of the possibility of leading our patients into disastrous habits of self-indulgence by a lack of precision in our directions as to quantity.

The treatment of acute alcoholic poisoning must consist in removing all the spirit from the stomach by means of the stomach-pump, and endeavouring to rouse the patient from his perilous state of coma by cold affusion, strong coffee, surface stimulation, and galvanism, whilst artificial respiration may be employed to stimulate the flagging breathing powers. In more chronic cases, withdraw all stimulant absolutely and at once; insure sleep by chloral and bromide of potassium; and try to diminish the morbid craving by capsicum, nux vomica, the mineral acids, and a liberal and varied diet.

The following are the relative proportions of absolute alcohol in some of the commoner liquors:—

	PER CENT.
Brandy, gin, whisky . . .	30 to 50
Sweet Spanish and Italian wines	13 to 17
Hock and claret	8 to 11
Edinburgh ale	6
Stout	4

STIMULANTS AND SEDATIVES.

Stimulants and *sedatives* are so directly antagonistic in nature that the most satisfactory scheme of the action will be presented by direct contrast in parallel columns, according to the plan adopted generally through these pages.

I. *General Stimulants.*

As the principal members of this group we may mention alcohol, opium, and the anæsthetic vapours, which, whilst stimulant in small, are narcotic in large doses; the ethers and ammonia, which are called diffusible because rapid elimination prevents any marked display of their stupefying qualities. We may refer to the article on Alcohol for directions as to the use of stimulants in health and disease. Then, again, the cold douche, counter-irritation, and electricity may act as powerful stimulating agents under certain conditions.

I. *General Sedatives.*

The stimulating drugs in the opposite column, when carried beyond a certain point, cause a sedative or soothing action, and run by insensible degrees into the truly narcotic class of remedies. Over-stimulation produces exhaustion, and indirectly a sedative action.

II. *Special Stimulants.*

1. *To the Nervous System.*—Alcohol, ether, and opium undoubtedly stimulate the brain, causing greater intellectual activity and an increased

II. *Special Sedatives.*

1. *Nervous System.*—The best sedatives to the brain are undoubtedly those drugs which diminish its blood supply and so cause sleep.

flow of ideas, occasionally somewhat irregular in form. Phosphorus may be ranked under this heading, and digitalis may improve the functions of the cerebral hemispheres by the more regular supply of blood which its tonic influence on the arterial system provides.

The spinal cord is directly and powerfully stimulated by strychnia, and in the lower animals by morphia; whilst ergot and belladonna, by contracting its vessels, may help in removing various conditions of debility. Certain nervous centres are stimulated by certain drugs. Thus, atropia stimulates the respiratory centre, the indirect emetics stimulate the vomiting centre, strychnia the vaso-motor centre, &c. The ear-ringing property of quinine is probably due to an irritative action on the auditory nerve, digitalis stimulates the vagus, whilst jaborandi and muscarin confine that action to the intra-cardiac inhibitory apparatus. The sialogogue action of jaborandi is believed to be due to a stimulation of the periphery of the salivary nerves.

2. *Cardiac and Vascular* Conium is held to exert a special sedative effect on the great motor ganglia.

The principal spinal sedatives are Calabar bean, bromide of potassium, chloral, methyl conia, and gelsemium, which powerfully depress the reflex functions of the cord.

The respiratory centre is depressed by chloral hydrate, hydrocyanic acid, amyl nitrite, aconite, opium, &c.

An interesting selective action of a sedative or paralysing nature is exerted by the following drugs on the following nerves. Atropia paralyses the intra-cardiac inhibitory apparatus and the terminal fibres supplied by the third nerve to the iris. Conium paralyses the third nerve, gelsemium the sixth, and croton chloral the fifth. Atropia also exerts an inhibiting influence upon the secretory nerves of the submaxillary gland, &c.

2. *Cardiac Sedatives.*—The

Stimulants.—The general stimulants already enumerated undoubtedly stimulate the heart, and the class of drugs of which digitalis is the type have been already considered under cardiac tonics. Opium is decidedly a vascular stimulant.

3. *Digestive and Secretory Stimulants.* — The stomach may be stimulated by ginger, capsicum, pepper, and the like; whilst cholagogues, diuretics, purgatives, and diaphoretics may be held to stimulate the liver, kidneys, intestines, and skin, by promoting or exciting their respective functions.

principal cardiac sedatives or depressants are aconite, tobacco, colchicum, chloral, chloroform, and potassium nitrate

3. *Digestive and Secretory Sedatives.*—A sedative action on the stomach may be produced by hydrocyanic acid, bismuth, alkalies, arsenic, and silver, generally in small doses, whilst counter-irritation over the epigastric region is often an effectual means for the relief of pain.

ETHER.

Local Action.

Physiological.

The projection on the skin of a very fine spray of especially pure ether, by means of Dr. Richardson's ingenious instrument, causes at first a sensation of extreme cold, attended occasionally by the formation of ice. In about a minute, or even less, to this succeeds a sudden blanching of the surface, the skin becoming hard and quite insensible, and a

Therapeutical.

Advantage has been taken of the insensibility to pain produced by the ether spray, to use it extensively during the performance of many minor operations, and more especially in those which consist merely of a single cut or prick. Under these conditions it acts admirably, but the hard and brawny state of the integument produced by its action renders it

sharp cutting pain, like a burn, being at the same time experienced. Bromic ether is said to produce local anæsthesia without freezing the skin.

If this action is kept up for some time, redness, tingling, vesication, and even sloughing may be produced.

Be careful always to procure the compound anæsthetic ether, which has a high boiling point, and evaporates rapidly, as ordinary qualities of the drug are of no use for local anæsthesia.

of little or no aid where dissection or manipulations of deep-seated structures are required. Further objections to its use are the acute pain attending application, and the subsequent redness, tingling, and irritation of the skin.

It has also been recommended as a sedative in neuralgia, and as a convenient means of applying intense cold; and cases of its successful employment in chorea, applied to the upper part of the spine, have been recorded.

Internal Actions.

Ether, when taken internally, is stimulant and antispasmodic.

It is therefore a useful remedy in hysteria, flatulence, spasmodic asthma, &c.

Combined Internal and External Use.

Ether has powerful anæsthetic properties, and differs from chloroform in the following respects. It increases instead of diminishing the arterial pressure, and acts as a tonic to the heart, which continues to pulsate in fatal cases after the arrest of breathing. The following is the order of involvement of the nerve centres :—

The stimulant action of ether on the heart has caused its use to be warmly advocated as in all respects superior to chloroform. It cannot, however, be considered absolutely safe ; and it labours under several disadvantages, such as the greater length of time required to produce anæsthesia, the violent struggling occasionally observed, the disagree-

1. The cerebrum.
2. The sensory centres of the cord.
3. The motor centres of the cord.
4. The sensory centres of the medulla oblongata.
5. The motor centres of the medulla.

able smell of the drug, &c., and the greater tendency to hæmorrhage during its administration. Gubler expresses a strong preference for chloroform, as being more convenient, and as some persons, according to him, cannot be brought under the influence of ether. Some French authorities have described pneumonia and bronchial irritation as following the inhalation of ether.

Thirteen deaths have been collected by Mr. Cawtley Dawson, of Leeds ('British Medical Journal,' March 1878), as having been caused by its use, with probably five in America, the fatal result having occurred from asphyxia, probably caused by the intense cold produced by the ether contracting the small blood vessels of the lungs to an injurious degree.

Mode of Administration.

It is most important that no air be admitted during ether administration, as violent resistance and dangerous struggling supervene if the vapour be not inhaled in a state of purity. Non-attendance to this point caused ether to fall into discredit soon after its original introduction, and it is only lately that we have been fully convinced that, by using this simple precaution, we may readily obtain complete anæsthesia and perfect

muscular relaxation in from three to eight minutes. Various inhalers have been devised to fit tightly over the mouth and nose, and it is here essential that some instrument of the kind should be used.

When operating by artificial light, do not forget the inflammable nature of the vapour of ether.

The British Pharmacopœia has lately introduced into its pages the old-fashioned Hoffman's anodyne, under the name of *Spiritus ætheris compositus*. Dose, 30 m. to 2 dr.

SPIRITUS ÆTHERIS NITROSI.

This preparation, in doses of from ½ fl. drachm to 2 fl. drachms, is diuretic and diaphoretic, and is much used in feverish conditions.

CHLOROFORM.

Local Action.

Physiological.

Chloroform, when allowed to remain for some time in contact with the skin, acts as an irritant, causing redness and smarting, followed by vesication.

It has also, however, some sedative properties.

Chloroform is an excellent solvent of caoutchouc, gutta-percha, and many fats and resins, and gutta-percha dissolved in it to saturation is an excellent application in small-pox and erysipelas.

Therapeutical.

The locally sedative action of chloroform has led to its extensive use as an application for the relief of rheumatic or neuralgic pains, the liniment being a convenient form.

It is also a useful remedy for allaying the itching of some chronic forms of skin disease.

Constitutional Action.

Chloroform, when taken internally, may act as a stimulant, sedative, and antispasmodic.

It is a useful remedy in hysteria, asthma, and nervous palpitation, for the arrest of sea-sickness and other forms of vomiting, and for the soothing and quieting of some forms of irritable cough.

Combined Local and Constitutional Effect.

Under this heading it may be convenient to discuss the anæsthetic properties of chloroform, and this we will now proceed to do on the plan adopted generally throughout these pages.

1. *On Brain and Nervous System.*—Chloroform has first a stimulating, and secondly a sedative, action on the brain, a good deal of excitement and struggling taking place during the early stages of inhalation, whilst, during the later, narcosis is complete, and the patient lies quiet and motionless. This condition resembles natural sleep by being associated with anæmia of the brain, but differs by its rendering the patient quite insensible to external impressions, including the most severe cutting operations, this

In the early stage of inhalation the patient usually feels confused and giddy, his eyes are suffused, his face congested, and the heart beats rapidly. This is often followed by apparent insensibility, from which, however, he can readily be roused, and very frequently a stage of violent excitement ensues, during which he struggles violently and with remarkable muscular force, talking and singing incoherently meanwhile. This stage has been described as that of alcoholic intoxication. Succeeding to this we have that of 'anæs-

effect being due to a paralysing influence of the drug on the ganglionic centres of the sensory nerves.

The reflex functions of the cord are also lulled to slumber, and if the inhalation is pushed too far, paralysis of the respiratory centre may ensue. Its inhalation under certain circumstances is apt to excite erotic sensations in women, and to lead them to bring unfounded accusations against medical men.

2. *Heart and Circulation.* —On the heart the influence of chloroform is at first slightly stimulating, the pulse becoming quickened ; but secondary depression follows from a paralysing influence on the sympathetic ganglia, the pulse now growing slower, and the arterial tension becoming lowered.

3. *Respiration and Temperature.* — The respiration tends at first towards increased rapidity, but if the inhalation is pushed so far as to affect the respiratory centre, the breathing grows slower, and finally ceases. We usually observe some tendency to perspiration attending chloroform inhalation, and a consequent thesia,' in which he is profoundly insensible, with contracted pupils ; and finally we reach that of 'narcosis,' in which the face becomes congested, the pupils dilate, and stertorous breathing sets in. Chloroform inhalation is used during its first stage to alleviate the pain of child-birth, it being found that full anæsthesia under these circumstances is apt to relax the uterine muscular tissues, and not only to check their contraction, but to predispose to future hæmorrhage.

During the second stage chloroform is used for the purpose of obtaining full and complete insensibility to pain during the performance of operations ; and this invaluable property has deprived the practice of surgery of much of its former horrors.

We also employ it freely to relax muscular tension and spasm, and so facilitate the reduction of hernia and dislocation ; for diagnostic purposes, in order to dispel phantomic uterine tumours, as well as to enable us to make a careful examination of extremely painful parts.

slight reduction of temperature.

4. On the *digestive and secretive organs* chloroform seems to exert no marked influence, the sickness so frequently observed during recovery being purely reflex in character.

It is also of service for the relief of various forms of spasmodic affections, as whooping-cough, infantile and puerperal convulsions, chorea, and to alleviate pain, in cancer, during the passing of renal or biliary calculi, and under many other conditions.

Poisonous Properties.

Chloroform may kill in two ways. (1) By primarily paralysing the heart, and this has generally been considered due to the inhalation of air too highly charged with chloroform vapour, Mr. Clover holding that over 5 per cent. must be considered dangerous. Dr. Brunton, however, explains very ingeniously how it is that small doses are more apt to produce this effect than large, and why it is that deaths generally occur during imperfect narcosis. He points out that under these conditions the reflex contraction of the vessels is destroyed, whilst the heart is stopped or slowed, so that the irritation of a sensory nerve may produce syncope by stopping the supply of blood from the heart,

During the chloroform inhalation we must watch the pulse, and specially note enfeeblement, irregularity, or cessation of its beats, remembering also that cardiac failure may occur after the vapour has been withdrawn. Sudden pallor of the face, lividity, and gasping for breath are signs of ill omen. If the action of the heart seems to fail, we must administer stimulants by the mouth or rectum, excite the cutaneous surface with a towel by flicking or slapping, and give a whiff or two of ether, if the patient is able to breathe. Galvanism seems more likely to exhaust than excite the contractility of the heart muscle; and galvano-puncture, so much vaunted by

whilst the blood still flows rapidly from the arterial system through the capillaries into the veins. When the anæsthesia is complete, both reflexes are paralysed, and circulation remains unaffected by any impression made upon the sensory nerves.

It seems highly probable, however, that, in accordance with the views of Syme, Lister, Chiene, &c., fatal accidents from chloroform are not so liable to proceed from the heart as (2) from the respiratory function; and this mode of fatal accident has been again subdivided into two headings: 1st. Death by apnœa, or stoppage of the breathing, from nervous influence or mechanical causes. 2ndly. By suffocation from excessive formation of carbonic acid in the blood. Of these, the first is by far the more common, and is often caused by falling back of the tongue, or by paralysis of the intrinsic muscles of the larynx, closing the glottis. It therefore follows that whilst engaged in administration of chloroform, the foreign observers, has not been tried in this country.

Chloroform accidents depending, in a great majority of cases, on failure of respiration, we must endeavour to re-excite this function by cold sprinkling or ammonia vapour, but most hopefully by the steady and persevering use of artificial respiration. Always, however, see that no mechanical hindrance to breathing exists, and more especially take care to draw the tongue well forward, for this will act purely mechanically, or by pulling the epiglottis forward and thus opening the glottis by the traction made on the arytenc - epiglottidean muscles. The same object may be attained by raising the chin and drawing it forcibly away from the spine.

Galvanic stimulation of the phrenic nerve has been recommended, and several apparently hopeless cases have been saved by the process of inversion as originally proposed by Nélaton.

The inhalation of nitrite of amyl has also been recommended as averting the asphyxia of pulmonary stasis,

breathing must be very carefully watched.

and tracheotomy has been successful in some apparently hopeless cases.

Absorption and Elimination.

Chloroform is rapidly absorbed and rapidly given off by the breath and urine, in which secretion it can be readily detected.

Dose, Mode of Administration, &c.

Fatal accidents from chloroform have become so alarmingly frequent of late, the total probable number, according to Bartholow, amounting to over 500, that some surgeons even consider its use unjustifiable; but it is on the whole the best anæsthetic, and, by adopting the following precautions, we may hope to imitate the success of the Edinburgh School, where danger or inconvenience rarely occurs, Mr. Syme having met with no death during 8,000 administrations.

1. Never permit inhalation to take place in a sitting posture, and see that the patient's neck is free from all constriction.

2. Give strict orders that no solid meal be taken for at least two or three hours previously, but a little beef-tea may be allowed, and a small sip of brandy is useful, or the inhalation of a few whiffs of ether just before the operation. The sickness which so frequently attends a loaded stomach is not only inconvenient, but has proved fatal by suffocation from the drawing of vomited matters into the air-passages. And, in addition to this danger, vomiting is attended with special risks after such operations as ovariotomy and cataract extraction, and after the first of these it occasionally continues with exhausting pertinacity.

3. Use no special form of inhaler, but pour the chloroform freely on a towel or other porous material, and give it without fear. Tell the patient to close his eyes and to inspire deeply, and when the period of excitement comes on do not suspend the

inhalation, but keep the towel firmly applied to the face until calm sleep is produced, or the slightest indication of stertor is heard. Complete anæthesia is proved by abolition of reflex action, as shown by insensibility of the eye, by muscular relaxation, and by insensibility to pain.

When the operation is over, let the patient recover naturally, and do not disturb his sleep by the purposeless towel flickings so frequently to be seen in operating theatres.

As regards the quantity of chloroform to be used for each inhalation, it is impossible to lay down any rule, for the inconveniences occasionally met with seem to bear no sort of proportion to the dose of the anæsthetic. If the chloroform be of good quality, it is safer, as shown by Brunton, to give it freely, and it is better to trust to our own care and skill than to the fancied safety of inhalers. It can never be possible to deprive an unnatural condition like profound anæsthesia of all dangers, and even the theoretically safe instrument of Clover, with its guaranteed 3 per cent. of chloroform vapour, has been shown to be not absolutely free from risks.

It would be very satisfactory could we lay down any laws for our guidance in anticipating danger from chloroform inhalation in any special class of cases, but this unfortunately we cannot do. It is now well known that neither organic disease of the heart nor conditions of extreme debility are contra-indications ; and although fatty heart is frequently discovered *post mortem*, we cannot absolutely state that this is not a mere coincidence, nor can we pretend to diagnose such degeneration with any certainty during life. Some authorities believe that chloroform is more dangerous to the old than to the middle-aged or young, and there seems no doubt that habitual topers are brought under its influence with considerable difficulty.

Chloroform is most generally given internally under the form of the spiritus chloroformi, or chloric ether, or the compound tincture in which it is very pleasantly combined with cardamoms, in doses of from ℥x. to ʒj., or we may make a

good emulsion with 20 minims in ʒj. of milk. The P. B. has now introduced the tinctura chloroformi et morphinæ, a very complex preparation, containing, in addition to the principal ingredients, ether, prussic acid, peppermint, treacle, liquorice, and syrup. Dose 5 to 10 minims.

The late Mr. Clover very kindly furnished me for my second American edition with the following interesting summary of his views on the choice of anæsthetics.

The Choice of Anæsthetics.

For ordinary surgical cases, ether is safer than chloroform. The length of time needed to get a patient under ether is no longer a difficulty. Within the last four or five years the use of ether has increased rapidly in England in consequence of the adoption of better methods of administering it. Formerly the ether was given so abundantly as to excite choking and violent struggling. Now, methods which produce a certain degree of asphyxia, by preventing the access of fresh air and allowing the same air to be breathed over and over again, are generally adopted. By causing this degree of asphyxia the patient is made to take deep and frequent respirations, which carry the etherised atmosphere down to the lung cells. The atmosphere is thus made effective without being so strong as to cause local irritation. The least unpleasant way of inhaling ether is to begin with laughing-gas only, and introduce ether vapour gradually along with the gas, without allowing any fresh air to be admitted.

Chloroform is most suitable for children and for aged persons with brittle arteries, also for sustaining the anæsthesia during protracted operations inside the mouth. In some cases of operation on the eye, when it is desirable to diminish the hæmorrhage, chloroform is better than ether. In midwifery practice the same may be said.

Laughing-gas is best for ordinary tooth-extraction, for reducing luxations or moving stiff joints, for opening abscesses

and fistulæ, and other cases where anæsthesia is required only for a short time. For those operations which last from five to fifteen minutes it is found that laughing-gas, followed by a small quantity of ether and a very limited supply of fresh air, is the anæsthetic least often attended by sickness. The recovery of sensation is, however, much more rapid than when chloroform or ether alone has been used to the same effect, and where great pain is expected to result, a hypodermic injection of morphia is also needed.

The mixture of nitrite of amyl with chloroform has been strongly advocated recently by Dr. Sandford, an American physician. I have tried it in a dozen cases, and find that it produces insensibility rapidly, and, if the anæsthetic is then removed, the recovery is very satisfactory; but when the inhalation is continued for three or four minutes. there seems to be nearly as much subsequent depression and nausea as if pure chloroform were given. The nitrite has also the effect of producing a sense of fulness in the head in the surgeon and assistants, which is rather objectionable.—C.

NITROUS OXIDE GAS.

Physiological.

Nitrous oxide, or the old laughing-gas, has been recently introduced as an anæsthetic, a very brief inhalation causing perfect insensibility, preceded occasionally by slight excitement, and attended by an amount of lividity which at first sight seems most alarming. It has been shown that this insensibility is simply a condition of modified asphy-

Therapeutical.

Nitrous oxide gas is very valuable for the performance of such small operations as tooth-extraction; but anæsthesia cannot safely be kept up long enough to render it available during more prolonged surgical manipulations. During its administration we must rigidly exclude all atmospheric air, and thus prevent those violent and

xia, as during narcosis only two-thirds of the normal amount of carbonic acid is given off, and immediately after recovery only one-third.

varied evidences of excitement which have so often caused amusement during the old-fashioned inhalation of laughing-gas.

The evidences of complete anæsthesia are stertorous and interrupted breathing, feeble pulse, convulsive twitches, and lividity.

AMYL NITRIS.

Local Action.

Nitrite of amyl is not possessed of any local irritant or sedative properties.

Internal Actions.

Physiological.

I. *Nervous System.* — 1. *On Brain.*—No special effect is produced on this organ beyond that resulting from dilatation of the cerebral vessels, and consisting of a sensation of fulness and oppression in the head, throbbing, with giddiness and confusion of ideas. Crichton Browne has observed yawning and other movements suggesting a specific action on the motor centres of the mouth.

Therapeutical.

I.—1. It has been recommended as a remedy for epilepsy, in virtue of its dilating powers releasing the vessels of the brain from that condition of partial spasm which is said to be the cause of the disease. When given during the fit, it fails ; but the experience of Crichton Browne, confirmed by Weir Mitchell and others, shows that it has been successful, when given before the paroxysm, when a distinct aura is felt, and pallor of the face is observed, indi-

2. *On Spinal Cord.*—A distinct lowering of reflex irritability has been observed.

II. *Vascular System.*—1. *On Heart.*—After a brief inhalation of this drug, the action of the heart becomes excessively rapid, the face flushes, and a violent throbbing in all the arteries is experienced; and if its administration is pushed up to poisonous limits, there is much weakening of the cardiac pulsations.

2. The effect on the arterial system is one of marked dilatation, the vessels enlarging, as proved not only by general flushing, but by congestion of the retina, and by the free flow of blood from cupped surfaces which had previously yielded only a few drops. The arterial tension becomes much lowered, and this enlargement

cating anæmia of the brain from vascular spasm. It is also of service in that perilous condition known as the status epilepticus. It has also been used with some success in migraine.

2. It has been theoretically recommended in cases of tetanus and strychnia poisoning, and in neuralgia its inhalation has apparently been followed by relief.

II.—1. The nitrite of amyl has been proposed as an antidote in chloroform poisoning, and as a remedy for the peculiar heats and flushes so common in women about the menopause.

2. In consequence of this dilating effect on the vessels, amyl has been most successfully used in angina pectoris. The essential condition here is supposed to be one of spasmodic contraction of the smaller pulmonary and systemic vessels, against which the heart, generally weakened, as it is in this disease, by

of the calibre of the vessels has been proved to depend on a direct action of the drug on the muscular coats of the arteries, and not on any intervention of the vaso-motor system.

It has also been proved that oxidation is diminished, that the hæmoglobin of the blood is checked in its function of absorbing and giving up oxygen, and that, previous to death, the colour of the arterial and venous blood becomes almost precisely alike.

III. *On Respiration and Temperature.* — During the mal-nutrition of its muscular structures, finds itself unable to cope, and hence the agonising distress. Inhalation of the drug releases the spasm, and so gives ease; and this result follows whether there be actual valvular disease or not. This explanation of Brunton's, who had the merit of first using the drug in angina pectoris, has been disputed of late, Dr. George Johnson holding that the rise of arterial tension is not the primary cause of the agony, but is merely a secondary reflex result, and that the remedy acts solely in virtue of its antineuralgic virtues, seeing that relief is obtained with as much certainty when face flushing already exists.

Brunton's views, however, seem most in accordance with the facts observed; but whichever side be right, there can be no doubt about the accuracy of the evidence brought forward in favour of the clinical superiority of this over any other mode of treatment for this previously hopeless disease.

III. Amyl has been successfully used during the par-

early stage of amyl inhalation the respiration is hurried, but when the administration is further pushed the breathing becomes slower, and finally extinguished, from the arrest of the corpuscular action noted above, and from a paralysing effect on the respiratory nervous centre. The temperature tends to fall, from the diminution in the process of oxidation.

IV. *On the Digestive System.* — The presence of sugar in the urine has been observed during amyl inhalation, this being probably due to dilatation of the hepatic vessels.

oxysm of spasmodic asthma, acting, no doubt, by relaxing the muscular walls of the bronchial tubes, and it has also been confidently recommended as an efficient remedy for whooping-cough, an assertion which my own experience does not confirm.

IV. Amyl has been theoretically recommended in cholera; but there is no special evidence in its favour, and it is said that sea-sickness has occasionally yielded to its use.

Mode of Administration, Cautions, &c.

Amyl is now known to act much more speedily and effectually when inhaled than when taken by the mouth, and from 2 to 5 drops placed on a handkerchief are cautiously drawn into the lungs until the characteristic flushing is produced. It may be very conveniently used in glass capsules, which the patient can carry readily about with him. Remember that it is very apt to deteriorate by keeping, and that the druggist's stock must frequently be renewed.

No special accidents are recorded as having arisen from its use; but the caution seems a reasonable one, not to recommend it rashly to old persons with brittle or calcareous arteries, as the sudden alteration of calibre might be attended with danger. Possibly also it might be advisable not to

recommend it to very plethoric patients, whose brains are already fully filled with blood.

Anæmic and epileptic patients seem to be specially tolerant of its use.

NITROGLYCERINUM—NITROGLYCERIN.

Trinitroglycerin, Glonoin.

Internal Effects.

Nitroglycerin is a poison exerting a marked effect on the nervous system, producing, according to Brunton and Tait, 'accelerated respiration, paralysis, loss of reflex action, and apparently to a great degree, of sensation, and death from stoppage of the respiration.' In frogs, after death, the brain is anæmic and heart empty, but the lungs are engorged with blood.

Medical Uses.

It has been recommended for epilepsy, headache, and asthma; it has no smell, but its vapours cause intense headache, throbbing, and fulness, rapid pulse, perspiration, and occasional nausea. Of late it has been highly praised by Dr. Murrell for the relief of angina pectoris, and clinical experience has so amply confirmed his statements that it is now an established remedy, not only for the major seizure, but for all forms of breathlessness and spasmodic discomfort possessing the anginiform quality. *Tabellæ nitroglycerini* are made of chocolate, and contain $\frac{1}{100}$ gr. Dose 1 or 2. Used in $\frac{1}{2}$-drop doses of a one per cent. solution every 3 hours, and cautiously increased, marked effects are produced, and decided relief afforded, its action being slower, but more permanent than amyl nitrite.

CHLORAL.

Local Actions.

Physiological.

Applied externally, chloral has been by some authorities supposed to have sedative properties, although the soothing action is preceded by some smarting and irritation, and it is also an undoubted antiseptic.

Therapeutical.

It has been recommended as an external application in neuralgia, rheumatic and other painful affections, and to check itching in eczema and prurigo.

Used as a dressing to ulcerated surfaces, it seems to act well by removing the fœtor of discharges and lessening pain; and it has been successfully employed, in solution, for the preservation of anatomical preparations, and for the injection of bodies, its only drawback being the disagreeable smell which results, and some blackening of the tissues on exposure to air.

Constitutional Actions.

I. *Nervous System.* — 1. *Brain.*—Chloral produces an anæmic condition of the brain, and thus causes sleep by imitating the natural anatomical arrangement of that process. The resulting slumber begins very quickly after the dose is

1. Chloral is an excellent hypnotic, causing sound and refreshing sleep, without the digestive disturbance which usually follows the use of opium. It may be given in simple insomnia from mental worry, overwork, or other

swallowed, it is usually sound and dreamless, and the patient wakes in seven or eight hours well refreshed, and without any marked feelings of *malaise* or digestive disturbance. Exceptions to this, however, have been observed, and in these chloral has caused preliminary excitement; but it is more than probable that an explanation may be found in the use of the impure specimens of the drug too often retailed. Liebreich believes that chloral exerts its hypnotic influence by undergoing transformation in the blood into chloroform and formic acid; but this is improbable, for the following reasons:—

(1) The alkali of the blood is too feeble to liberate the chloroform, and its albumen is considered antagonistic to such a process.

(2) No smell of chloroform can be observed in the breath, and no anæsthetic effect is produced on the sleeper by moderate doses.

2. *Spinal Cord.*—The reflex irritability of the spinal cord is very decidedly lessened, and it is a remedy of great value in all diseases in which dangerous depression is apt to follow the continuous want of sleep. Thus in typhus, in delirium tremens—where it must be pushed boldly in conjunction with an absolute suspension of all alcohol—in phthisis, acute mania, &c., we may prescribe it with much confidence of success. It has also been recommended in France as an anæsthetic by intravenous injection; from 2 to 4 drachms, thus made to enter the veins, being there supposed to yield chloroform, which then exerts its usual influence. There is no reason, however, to believe that anæsthesia, if thus produced at all, which is more than doubtful, is in any degree safer than the old mode of inhalation; and as the patient is thus exposed to the additional risks of thrombosis, inflammation of the veins, and the entrance of air, we cannot wonder that this process has found no favour in this country.

2. Chloral is of service in some spasmodic diseases, as chorea, whooping-cough, asth-

sened, and the respiratory centre becomes weakened and eventually paralysed.

3. *Sympathetic and general Nervous System.*—The vaso-motor system is enfeebled, but no special effect seems to be produced on other nervous structures, unless we believe any part of the loss of muscular power, sometimes observed in those who have taken chloral for some time, to be due to an action on the motor nerves.

II. *Circulatory System.*—Chloral has a powerful action on the heart, lowering and weakening its action by paralysing its contained sympathetic ganglia. That this effect is not produced through the medium of the vagi is shown by the fact that it comes on

ma, incontinence of urine, labour after-pains, &c. It is also undoubtedly useful in tetanus, which has been thus successfully treated on many occasions, Gubler recording 36 cases with 21 recoveries, and Chopard publishing 80 successful cases.

If the patient cannot swallow, the drug may be used as an enema with milk and yolk of egg. It may also be given as an antidote to strychnia.

3. Chloral, having no influence over sensory nerves, has no power, *per se*, of allaying pain, and is therefore useless in that class of cases where opium is of such signal service. It seems, however, to relieve the pain of the early stages of labour before the full dilatation of the os uteri.

II. Chloral, weakening cardiac action, must not be given where we have any reason to suspect an enfeebled state of the heart muscle; and we thus have a complete explanation of the uselessness of the drug as a narcotic, when flaccid vessels allow free gravitation

even after these nerves are cut, and their terminal cardiac filaments paralysed by atropine. Along with this slowing of the pulse we get lessened arterial tension from dilatation of the superficial vessels.

III. *Respiration and Temperature.* — The breathing tends to become slower, and finally to cease, from paralysis of the respiratory centre; but urgent dyspnœa has occasionally been observed, and this has been ascribed to dilatation of the pulmonary vessels, causing an increased afflux of blood to be directed suddenly to the lungs.

The temperature falls, and this is, no doubt, due to surface evaporation produced by the dilated cutaneous vessels.

IV. *Secreting and Digestive Systems.*—No special influence is produced on any of these, but occasionally vomiting and purging have followed the use of chloral.

of blood to the brain during the recumbent posture, congesting its tissues, and thus effectually preventing sleep. Its action is most satisfactory when the circulation is strong and the arteries tight.

III. This effect on the respiratory centre naturally suggests caution in prescribing chloral in cases of advanced bronchitis with rapidly accumulating mucous secretion and deficient oxygenation of the blood. Chloral has been used with success in spasmodic asthma. It has been much recommended in whooping-cough, but I have been unable to trace any therapeutic effect, beyond that to be ascribed to the soothing influence of sleep.

It has been highly recommended as an efficient remedy for sea-sickness.

Absorption and Mode of Elimination.

Chloral is rapidly absorbed by the blood, and given out by the urine, the breath, and probably the skin.

Poisonous Effects.

Chloral may kill by cardiac syncope, and, as this effect has

Antidotes.

Here our efforts must first be directed to obviating the

been known to follow a single dose of 30 grains, considerable caution must be exercised in its use, the very uncertainty of its action warning us always to feel our way with great care. Cases of recovery have been recorded after quantities of 320 and 165 grains respectively, but, on the other hand, sudden death has occasionally followed a very moderate dose; or again, death may ensue from paralysis of the respiratory centre, with coma and gradual suffocation; and finally a series of cases has been recorded in which symptoms arose akin to blood-poisoning, with purpuric and scorbutic eruptions, ulceration of gums, and great prostration, ending in death.

tendency to death. We must endeavour to restore the heart's action by warmth and stimulants; promote breathing by irritation of the surface, galvanism, and artificial respiration; counteract the rapidly lowering temperature, on which so much danger depends, by warmth; and finally employ physiological antidotes, such as atropia and strychnia.

One case is on record in which very alarming symptoms caused by taking 370 grains speedily yielded to two subcutaneous injections of strychnia.

Cautions, Mode of Administration, Dose, &c.

It is recommended that re-crystallised chloral only should be prescribed, as the commercial article is liable to be contaminated with impurities and the results of decomposition. Liebreich holds that many of the commonly described bad effects of chloral are due to impure preparations, which are unfortunately only too effectually masked by the syrups now in such general use. It is easy to detect impurity of the crystals, which should not be acicular in form, and cake chloral should always be distrusted.

The use of chloral requires caution, as many instances of

death from its employment are on record, and other cases have been noted in which very serious symptoms followed doses varying from 10 to 50 grains. We must also be mindful of other physiological peculiarities. Thus great muscular prostration, more especially affecting the legs, and causing staggering, not very unfrequently follows its continued use.

Persons vary, however, in a very remarkable manner with regard to their susceptibility to the action of chloral, alcoholism lessening this in marked degree. Mr. Hulke ('Clin. Soc. Trans.' 1875) records a case in which a young lady, æt. 23, took in one dose 320 grains, causing lividity, failure of respiration, weakened action of the heart, and contraction of the pupils, from which she was recovered with difficulty by the stomach-pump, artificial respiration, and strong coffee. Mr. Bishop, of Boston, had a case in which a patient, suffering from delirium tremens, took 165 grains, followed by thirty-six hours' profound sleep, and a perfect cure on waking.

Prof. Gairdner met with a case of chorea in a little girl of eight, where 45 grains were taken by mistake, with perilous immediate consequences, but entire removal of the disease. It is believed on somewhat vague evidence, that chloral-eating is practised on a large scale with resulting cerebral anæmia, and moral and muscular weakness; and the best-marked case I have met with is published by Mr. Tuffis, of the Edinburgh Asylum ('Edin. Med. Journ.' 1877), where 180 grains were regularly taken every day in frequent doses, causing dyspepsia, moral perversion, muscular weakness, a feeble heart, loss of memory, and epileptiform fits, speedily removed by withdrawal of the drug.

Various skin eruptions, usually confined to the face, beginning as spots of roseola, coalescing to form patches of erythema, occasionally generally diffused purpuric patches, and the very peculiar deep flushing of the face following the use of stimulants, and due, no doubt, to vaso-motor paralysis, have been carefully described by Dr. Crichton Browne and other observers.

There seems no doubt that chloral acts more powerfully in persons whose blood is strongly alkaline, and Prof. König found that the previous administration of sodium bicarbonate heightens the narcotic effect. In this way is explained the great susceptibility to the action of chloral noted by Dr. Russell, of Glasgow, in typhus fever. Liebreich believes it to act unfavourably in acute rheumatism, on account of the acid state of the blood. He recommends us never to give it on an empty stomach, nor to combine it with milk.

Considering the undoubted fact that not only dangerous symptoms, but even death, have followed a dose of 30 grains, and even of 10 grains, we must begin, as a rule, with 20 grains, or a smaller quantity, to be repeated as occasion requires. In labour give one dose of gr. xv., repeated if necessary in two hours. We must remember, however, that the narcotic action of chloral is not invariably exhausted in the single sleep to which it originally gives rise, but it may be held over until next night, so that our best practice will be to give a full dose only once in the forty-eight hours. The taste and smell of chloral being pungent and disagreeable, we must endeavour to render our prescription as palatable as we can. The syrup contains 10 grains to the drachm. Or we may use the following formula:

℞ Chloral hydratis gr. xx.; syrupi aurantii ʒj.; aq. menth. pip. ad ℥ij. Fiat haustus horâ somni sumendus.

As an injection for anatomical subjects we dissolve about 90 grains in water. By rubbing together powdered camphor and chloral hydrate, a fluid of syrupy consistence is obtained which forms a useful application in neuralgia, prurigo, &c.

For preserving anatomical preparations, gr. v. ad ℥j.; as a dressing to wounds, ulcers, &c., gr. xv. ad ℥j.

In eczema gr. lx. to an ounce of lard.

BUTYL-CHLORAL.

Formerly called croton chloral.

Local Action.

None has been described.

Constitutional Action.

Physiological.

I. *Nervous System.*—1. *Brain.*—Butyl-chloral causes sleep in from fifteen to twenty minutes.

2. *Spinal Cord.*—No action is produced on the spinal cord, nor consequent muscular relaxation. Some paralysing influence is eventually exerted in the medulla.

3. *Sympathetic and other Nervous Systems.*—No influence seems to be exerted on the vaso-motor nerves, but on the fifth a well-marked sedative effect is noted, indicated by anæsthesia of the head and face, loss of irritability of the eyeball, and failure of the

Therapeutical.

I. Butyl-chloral has been highly praised by its discoverer, Liebreich, as a narcotic, being given by him in doses of from 15 to 30 grains. There is little English experience to quote on this heading, as the doses used here are far too small to produce sleep.

3. The anæsthetic influence of butyl-chloral would naturally suggest its use in facial neuralgia, and a good deal of success has been thus obtained in dealing with this troublesome affection, doses of from 2 to 6 grains having generally been prescribed.

nerve-trunk itself to respond to galvanic stimulation.

II. *Circulation.*—Butyl-chloral has physiologically less tendency than chloral hydrate to weaken or lower the action of the heart.

II. Experience has shown it to be an uncertain remedy, and dangerous and even fatal symptoms have followed ordinary doses in organic heart disease.

III. *Respiration and Temperature.*—Butyl-chloral tends to lower the rate of breathing, and eventually kills by paralysing the respiratory centre.

Dose gr. ij. to xv.

CAFFEINA

Is principally used to prepare caffeinæ citras, which is a drug of well-marked physiological activity, but is used in medicine as a diuretic acting by directly stimulating the renal cells without raising the blood pressure, and it acts best either in combination with or in immediate succession to digitalis. It increases at first, but afterwards diminishes, the excretion of urea. Dr. Thorowgood praises it highly in asthma, best given in warm coffee. Dose gr. j.–v.

CREASOTE.

This drug is now but little used, but is a useful remedy in some forms of sickness and vomiting, as an inhalation in ozæna and various lung diseases with fœtid expectoration, and as a local application in toothache.

The mistura creasoti, containing ♏ j. to the ounce, is a convenient mode of administration.

CARBOLIC ACID.

Local Action.

Physiological.

Carbolic acid is, in the first place, an antiseptic, from its power of destroying the minuter forms of animal and vegetable life.

It is also a useful application in tinea tonsurans, both as destroying the microspores and preventing their development; but, as redevelopment very rapidly takes place, we must apply our remedy every six hours, and continue its use for at least a fortnight after the apparent cure.

Injections (ɱss.) of pure acid into various parts of the tumour, are very useful in nævus, and also in varicose veins.

Therapeutical.

It is therefore much used as an antiseptic and deodorant for the treatment of ill-smelling drains, &c., or to destroy the infectious properties of various secretions or discharges from the sick. It may also be useful as a lotion or injection to foul sores. Its principal application, however, in surgery, is in enabling us to carry out the far-famed antiseptic system of Prof. Lister. This eminent surgeon, adopting the views of Pasteur, and believing that suppuration, pyæmia, and various other inconveniences connected with open wounds, arise from the irritation of minute germs or particles of organic matter contained in the air, has devised a process in which the atmospheric air, before reaching the raw surface, is filtered through carbolic acid and thus deprived of its irritating properties.

We extract from Mr. Cheyne's excellent book on antiseptic surgery the following clear and condensed description of

the way in which Lister's method is applied :—'Take as an example of an operation the removal of a fatty tumour :

'The patient having been brought under the influence of chloroform, or other anæsthetic, the skin over the tumour, and for some distance in the vicinity, is thoroughly purified from any active dust by washing it well with a solution of carbolic acid 1–20. The surgeon and his assistants also well wash their hands in 1–40 carbolic lotion, while the instruments are put to soak in 1–20 ; a towel is arranged close to the tumour, generally on the part of the table between the operator and the patient, which towel has been well soaked in 1–20 carbolic lotion, and is meant as an antiseptic basis on which instruments may be laid during the course of the operation without any fear of their contamination. This towel is so arranged as to be within the cloud of spray. A spray being now made to play over the part from a convenient distance, the surgeon makes his incisions, removes the tumour, ties the vessels with catgut, introduces a suitable drain, stitches up the wound, and applies a piece of protective lint, little larger than the wound, the protective being of course dipped in the 1–40 carbolic solution ; outside this is applied a piece of wet gauze, consisting of several layers of loose gauze, which has been soaking for some time in the 1–40 carbolic solution. This wet gauze and protective are called the *deep dressing*. The wet gauze must overlap the protective in all directions. Then any remaining hollow is filled up with loose gauze, and outside the whole a gauze dressing is fixed. This dressing consists of a piece of carbolic gauze of suitable size, folded in eight layers, and having the macintosh placed beneath the outermost layer, with the india-rubber side inwards. The dressing is fixed by means of a bandage, and when this is accomplished the spray may be stopped. Then around the edge of the dressing an elastic bandage is applied so as to keep the edge constantly in contact with the body, and to allow no interval to occur between the dressing and the skin during the movements of the patient. The elastic is carefully fixed to the edge of the

dressing by means of safety-pins. In the after progress of the case the dressing is changed according to the amount of discharge, though in no instance is it left longer than eight days.'

Physiological.

Carbolic acid is an irritating substance, and, if applied sufficiently long to the skin, will cause sloughing.

It has, however, undoubted local anæsthetic properties.

It is also readily absorbed through the skin, and Continental observers describe dangerous results as frequently following its use in antiseptic surgery. These, however, are rarely, if ever, met with in British practice ; Mr. Cheyne telling us that serious symptoms have only twice occurred in Prof. Lister's practice. This he ascribes to the fact that the acid is brought as little as possible in contact with wounds.

Therapeutical.

Although carbolic acid may be of use in correcting fœtor, it is too irritating to make a good lotion for wounds or ulcers. It has been used as a caustic in some ulcerative affections, as lupus. It has been recommended as a local anæsthetic during small operations, and to deaden the pain of some caustic applications.

We must therefore remember that symptoms of poisoning may readily be produced by the application of carbolic acid over any considerable cutaneous area.

The inhalation of carbolic acid, its local application by spray, or the diffusion of a 20-per-cent. solution in spray through the room, has proved very useful in whooping-cough ; and the bacillary theory of phthisis naturally suggests the destruction of the active agents in producing the disease by this or some other form of antiseptic inhalation. For which cases Dr. R. J. Lee has invented a very convenient form of inhaler.

Internal Action.

Physiological.

Carbolic acid, if administered in sufficient quantity, is very poisonous in its operation, killing by causing paralysis of the respiratory centre. The heart continues to beat even after the respiration is arrested, and the temperature falls. In severe cases we find collapse, with stertorous breathing, great pallor, and sudden death from respiratory failure; whilst a milder attack is characterised by loss of appetite, nausea, and vomiting a large secretion of frothy saliva, dysphagia, anxiety, and fever. The urine is diminished in quantity, and on standing acquires a dark green olive colour.

℞ Sulphuris præcipitati,
Zinci oxidi, . . āā ʒj.
Olei olivæ . . ℥j.
Acidi carbolici gr. xvj.

A good application in tinea tonsurans.

Therapeutical.

Carbolic acid has occasionally caused death by being accidentally drunk in mistake for beer, or by being incautiously applied to the skin. The best antidotes are olive oil and saccharated lime, also sulphate of sodium in dose of a tablespoonful every half-hour of a solution containing five parts in from one to two hundred parts of water, the antidote being held to convert the carbolic into non-poisonous phenol. The subcutaneous injection of sulphate of atropine has been advised, and also of ether and camphor.

It is occasionally given internally to counteract flatulence and sarcinous vomiting; but the sulpho-carbolates, and more especially that of sodium, are the most convenient forms for its administration in doses of 15 to 30 grains.

Absorption and Mode of Elimination.

Carbolic acid is rapidly absorbed, and quickly and entirely given off by the urine, to which it imparts a peculiar greenish-black hue and its own peculiar smell.

The official preparations of carbolic acid are acidum car-

bolicum liquefactum, glycerinum acidi carbolici, sodii sulphocarbolas, suppositoria acidi carbolici cum sapone, unguentum acidi carbolici. Sodii sulphocarbolas, gr. x. to xv.

ACONITUM—ACONITE.

Local Action.

Physiological.

Aconite, locally applied, causes a sensation of tingling, followed by numbness of the skin, from a paralysing influence, no doubt, on the sensory nerves. It may also bring about some local vasomotor paralysis.

Therapeutical.

Aconite is a most valuable local sedative in painful nervous affections, and more especially in *facial neuralgia*, where the tincture or liniment, applied along the course of the affected nerve, will often allay and even remove suffering.

Constitutional Action.

Physiological.

I. *On Nervous System.*—1. *Brain.*—In poisoning by aconite, the intellectual faculties are usually quite unaffected, but in some cases stupor has been observed.

2. *Spinal Cord.*—Aconite paralyses both the reflex and the motor activity of the cord, as evidenced by almost total loss of power in the muscular system.

The respiratory centre also eventually becomes paralysed,

Therapeutical.

and death may result by suffocation.

3. Although this loss of voluntary movement is supposed to be primarily spinal in origin, it is believed that the motor nerves themselves are secondarily affected, the paralysing influence beginning at their peripheral extremities. The inhibitory cardiac ganglia are first stimulated, and secondly depressed, and a sedative effect is produced on the sensory nerves, the earliest indication of the action of the drug being tingling followed by numbness and anæsthesia of the lips and throat.

Opinions differ as to the influence of aconite on the vaso-motor nerves, and it is not believed by many authorities to have any special operation over this system. Dr. Bagshawe, however, has published some cases of facial sympathetic paralysis, with injection and sweating following the local application of aconite, and the diaphoretic action, so often noted, must proceed from this cause. Experimental evidence, however, is very conflicting in this as well as in other

3. Aconite is one of our best remedies in *facial neuralgia*, given either alone or in combination with quinine. In *sick headache* also it is of service, and here it will be prescribed along with tincture of Indian hemp.

points, respecting the physiological actions of aconite.

II. *Circulating apparatus.*—Aconite is essentially a cardiac sedative, slowing the action of the heart at first from inhibitory stimulation, but then causing an increase in the rapidity of the pulsation, with feebleness and irregularity, ending in death by arrest of all movement in diastole. At the same time the arterial pressure falls in very marked degree.

II. Aconite is an excellent antiphlogistic, cutting short inflammatory processes in their early stages. Thus in *pneumonia*, *pleurisy*, *peritonitis*, *erysipelas*, *rheumatic fever*, and in the short sharp feverish affections of children, it is of signal service, and seems to have a directly curative action. Dr. John Harley ('St. Thos. Hosp. Reports,' New Series, vol. v.) made some interesting observations at the London Fever Hospital on the action of aconitine. He found that by giving $\frac{1}{200}$ of a grain once a day, which was quite sufficient to produce physiological effects, no influence was exerted on the course of 29 cases of scarlet fever, and that diaphoresis was only twice produced; whilst in 20 cases of typhus but slight controlling influence was exerted over the febrile process, although the cases did unusually well. This may prove either that the dose was not repeated sufficiently often, or that aconite has no real power over fully developed inflammatory

III. *Respiration and Temperature.* — The respiratory movements tend to become slow, finally irregular, and in some cases, and almost universally in the lower animals, death results from cessation of breathing.

The temperature falls decidedly.

IV. *Digestive and Secreting apparatus.*—Aconite has no special influence on digestion. It increases somewhat the salivary secretion, and augments largely the action of the perspiratory apparatus of the skin, bringing out in some instances an irritable vesicular eruption. The urine is also somewhat increased in quantity.

processes. In *coryza* and in *acute tonsillitis*, also, it has been much praised for the way in which it checks the full development of these troublesome affections ; and it has been highly praised as given in two-minim doses, where we have any reason to fear the occurrence of rigor, after catheterism.

III. Some part of the good effect of aconite in these febrile affections must be due to its power of slowing the breathing and reducing the temperature.

Aconite is therefore an excellent diaphoretic, and to this action in some degree is due its antipyretic properties.

Absorption and Mode of Elimination.

Aconite is rapidly absorbed, and given out probably by the urine. The alkaloid aconitine, if accidentally blown into the eyes or respiratory passages, causes well-marked conjunctival and bronchial irritation. Prof. Gubler, of Paris, values it very highly in neuralgia of the fifth nerve, which he has never known to resist a quarter of a milligramme of the nitrate of aconitine, corresponding to one-half milligramme of the pure drug. He thinks we distrust the drug too much, but draws attention to a peculiar præcordial disturbance, with palpitation and cardiac irregularity, rarely following its use, and warns us never to employ it in heart disease. The great danger attending the use of aconitine is the variation in its commercial forms, the English being usually seventeen times stronger than the German alkaloid.

Cautions and Modes of Administration.

The very poisonous nature of aconite renders caution necessary in its use, and we must prescribe it with great care in old persons, or where any suspicion exists of feebleness of the heart's action. In sound constitutions, however, and more especially in the case of children, we may use it with freedom, often obtaining most gratifying results.

It is essential to encounter the inflammation at an early stage, before structural changes have set in; and it is important to combine a little stimulant with the drug. In very acute cases, our best practice will be to give the tincture in small and very often repeated doses, carefully watching the effect on the pulse. One drop every ten minutes, half hour, or hour will be the best arrangement during the first day, after which every two hours will be a sufficient interval, the thermometer giving us meanwhile reliable information

regarding the progress of the inflammatory condition. In *facial neuralgia*, also, we shall obtain the best results by drop doses repeated at very short intervals, and in no case is it well to overstep a maximum dose of five minims.

The alkaloid aconitine is occasionally used as an external application in ointment, containing gr. j.–ij. to the ounce, but it is not only very expensive, but dangerous, on account of its extreme physiological activity. The liniment of the P. B. is an excellent and reliable preparation, and very useful in neuralgia and rheumatism.

Poisonous Properties.

Aconite may kill either by direct cardiac syncope, or, if the action be less rapid, by respiratory failure. Great muscular weakness is noted, the heart's action becoming feeble and irregular, the face pale, the body bedewed with clammy sweat, the pupils first contracted, and then dilated shortly before death closes the scene. The resemblance of aconite root to horse-radish has afforded several lamentable opportunities of studying cases of accidental poisoning.

Antidotes.

In poisoning by aconite, we must endeavour to sustain the flagging action of the heart by giving stimulants, and keeping the patient most rigidly in the recumbent posture, as death has occurred from syncope produced by suddenly sitting up in bed. *Digitalis* has been proposed as the physiological antidote, bracing up and restoring the contractility of the heart muscle, 20 minims of tincture being administered hypodermically.

PODOPHYLLIN.

Local Action.

Podophyllin cannot penetrate the unbroken cuticle, but experiment has shown that it exerts its purgative influence when applied to a raw surface.

Constitutional Action.

Physiological.

One marked physiological property of this drug is that of irritating the duodenum, stimulating the intestinal glands, and causing a profuse flow of watery evacuations, largely mixed with bile. Some controversy has taken place as to whether podophyllin can be called a cholagogue, in virtue of any direct stimulation of the secreting structures of the liver, experimental evidence seeming to show that it probably acts by contracting the gall-bladder, and thus favouring the expulsion of its contents, and by exciting the duodenum to sweep away the bile effused into it by the hepatic ducts. The more recent experiments of Rutherford and Vignal, however, have reinstated podophyllin in its old position as a true stimulant of the biliary secretion, the mistake made by Bennett, who denied its cholagogue action, having arisen from too large doses having been given, and the

Therapeutical.

Podophyllin is a valuable remedy in jaundice and in the various forms of functional liver affection. It may be used in simple chronic constipation, in the constipation of children attended with the painful and difficult evacuation of hard dry fæces, and in the opposite condition of diarrhœa with pale and frothy motions.

In sick-headache it also acts well.

irritation of the intestinal glands having been antagonistic to the hepatic secretion. (*Vide* Purgative.)

Cautions, and Mode of Administration.

We must remember that podophyllin is an uncertain drug, acting well in some cases, very slightly in others, whilst in a third class it causes much discomfort and griping. It is advisable, therefore, always to begin with small doses, as $\frac{1}{4}$ gr. or $\frac{1}{2}$ gr., and to prescribe it in the form of pill, combined with other ingredients which may restrain its irritating action. Thus :—

℞ Podophylli resinæ gr. ij.; extracti belladonnæ gr. iij.; pilulæ colocynthidis compositæ gr. xxxvj. Misce, fiant pilulæ duodecim, quarum capiat unam omni nocte.

Ringer recommends a very convenient way of prescribing podophyllin for children, by dissolving a grain in a drachm of rectified spirit, and giving 5 or 6 drops three or four times a day on a lump of sugar, or painted on a bun. The B. P. has now admitted the *Tinctura podophylli*, containing 1 grain in 1 fluid drachm.

PURGATIVES.

Purgatives may be divided first into two classes, depending on their origin, and these are :—

1. The inorganic substances, comprising chiefly the mercurials and salines.

2. Those derived from the vegetable kingdom, and which depend for their therapeutical action on the presence of resins or oils.

Their actual modes of operation, however, are much more varied, and they will best be considered by division under various headings according to their physiological and therapeutical properties.

Physiological.

1. *Laxatives.*—These substances act by causing a slight increase in the peristaltic movements of the intestines, with softening of the fæces, which are then expelled in a solid and formed condition.

Therapeutical.

1. The principal of these are sulphur, castor-oil, magnesia, &c.; but in addition to actual drugs we may include various articles of diet, as oatmeal, brown bread, whole flour, figs, prunes, &c., which act purely mechanically.

Laxatives are useful whenever we desire a mild and unirritating effect, as in simple constipation from dyspepsia, pregnancy, convalescence from acute diseases, sedentary habit, and other causes.

Castor-oil acts well in the early stages of diarrhœa, by sweeping away the irritating cause.

2. *Purgatives* produce more decided effects both in stimulating movement and secretion; but it is difficult to separate them entirely from either class No. 1 or No. 3.

2. Rhubarb, senna, aloes, and jalap are reckoned among the chief of these, and they are used in various dyspeptic conditions, rhubarb being more especially stomachic, and aloes emmenagogue, in their properties.

3. *Drastic Purgatives.*—These run by insensible gradations into the preceding class. Their action depends on irritation of the mucous membrane of the intestines, and not only produces an actual increase of secretion from their glands, but the

3. In this class we include jalap, scammony, colocynth, gamboge, and croton-oil, and they are principally used either in obstinate constipation, or to produce a derivative or species of counter-irritant effect in various forms of brain disease.

withdrawal of watery fluids from the blood. An overdose, therefore, may be attended by serious depression, discomfort, and even by death from inflammation of the bowels.

4. *Hydragogue Purgatives* cause very free secretion from the mucous membrane of the bowels, and empty the veins by withdrawing fluids from the blood.

4. These are elaterium, cream of tartar, &c., and they are most useful in ascites and other dropsical conditions, and for the relief of a feeble and labouring heart by diminishing the actual volume of the blood.

5. *Saline Purgatives.* — We have already, when treating of sulphate of magnesium, considered the action of this class, and have pointed out how, from their low diffusive power, they pass with difficulty into the blood, and how, whilst in the intestine, they not only absorb, retain, and carry away the watery fluids which they find in the intestine, but also directly withdraw fresh supplies from the blood itself. Professor Mathew Hay, of Aberdeen, thus sums up an elaborate investigation lately made by him into the action of saline cathartics :—' They cause no irritation nor inflammation

5. Sulphate of magnesium and many of the salts of potash and soda must here be included. They are best given in a state of free dilution, and form very efficient habitual purgatives, more especially in the form of various natural purgative waters, such as Friedrichshall and Püllna.

of the intestinal canal, nor stimulate in the smallest degree the secretion of the more important digestive juices, as the gastric, the pancreatic, and the biliary; have under ordinary circumstances little action on the blood, and mainly act by increasing the intestinal secretion and hindering the absorption of the intestinal fluid.'

6. *Cholagogue Purgatives.*—Much experiment has recently been expended on the action of this class, and those recently conducted on improved principles by Prof. Rutherford have given us very precise and reliable indications for practice. Cholagogues have been held to act either by directly stimulating the secretion of the bile, or by increasing the efficiency of the bile-expelling mechanism, and as the elaborate and important experiments of Rutherford have only reference to the first action, he prefers to use the term hepatic stimulant. Although any explanation of the action of this class of remedies must be almost purely conjectural, Rutherford believes that the

6. The principal members of this group are podophyllin, rhubarb, aloes, jalap, mercuric chloride, colchicum, euonymin, sanguinarin, ipecacuan, colocynth, sodium sulphate, sodium benzoate, sodium salicylate, &c. &c. They are used for the relief of various functional affections of the liver, to remove what is commonly known as 'biliousness,' and to obviate portal congestion.

effect is due to 'a direct action of their molecules upon the hepatic cells or their nerves.'

It is interesting to observe, as noted by Rutherford: 1. 'That when a substance produces purgation, but does not stimulate the liver, it diminishes the secretion of bile.' 2. 'That when a substance stimulates the liver as well as the intestinal glands, a moderate dose increases both the hepatic and the intestinal secretion, the effect on the former being most marked in the earlier part of the experiment, and diminishing as the purgative effect increases; but an excessive dose, by producing a violent purgative effect early in the experiment, may occasion nothing but diminished secretion of bile.'

In addition to drugs belonging to the actual purgative class, we have many indirect remedies which act with considerable efficiency. Thus we may use enemata, cold to the abdomen, mechanical kneading of the parietes, electricity; we may stimulate the muscular tissues to contraction; or we may cause a purgative effect by the use of drugs which act on the nervous system. Among the stimulating class we may mention strychnia, nux vomica, ergot, sulphate of iron, &c., and these are very efficient in combination with mild purgatives, where constipation depends on a lax or weakened state of the intestinal walls.

When spasm or irregular contraction prevents free ac-

gative action by relieving spasm.

tion of the bowels, we must have recourse to opium, belladonna, or acetate of lead, which under these conditions may be looked upon as true cathartics.

In administering purgatives we must consider the various parts of the intestinal canal on which they act. Thus senna, jalap, &c., act on the small intestine, aloes on the large, podophyllin on the duodenum, &c. We must also consider the time of their administration, as we find that the slowly acting resinoid substances are best given at night or before dinner, whereas the salines are best taken on an empty stomach, and more especially before breakfast. The mode of administration is also worthy of note, the resinoids being best taken in the form of pill, whereas the salines act best in solution with free dilution and in combination with bitters, iron, or sulphuric acid.

CALUMBA.

Local Action.

Calumba has no local action.

Constitutional Action.

Physiological.

On the Digestive Functions.—Like all bitter tonics, calumba stimulates the appetite and increases slightly the secretion of saliva and the gastric juice. It is lighter and more agreeable than some others of the class, and has been believed to have sedative

Therapeutical.

Calumba is a good tonic in deficient appetite from indigestion or simple want of tone in various dyspeptic conditions, and in most enfeebled states of the constitution, from whatever cause they may arise.

properties, in virtue of which it may be beneficially given in sickness and vomiting; but of this we have been unable to obtain reliable evidence.

Mode of Administration.

Calumba is usually given in combination either with iron, with alkalies, or with tonics. Thus:—

℞ Ferri tartarati ʒjss.; potassii bicarbonatis ʒij.; syrupi hemidesmi ℥j.; infusi calumbæ ℥vij. Misce, fiat mistura. Capiat unciam unam bis in die.

℞ Pulveris calumbæ gr. x.; sodii bicarb. gr. xx.; pulv. rhei gr. v.; pulv. zingiberis gr. x. Fiat pulvis bis in die sumendus ante cibum. A useful powder in some forms of dyspepsia.

PAREIRA.

Local Action.

Pareira has no local action.

Constitutional Action.

Physiological.

Digestive and Secreting Organs.—Pareira acts in some measure as a diuretic, but its main influence is directed to the bladder, which it appears to stimulate and strengthen, improving the tone of its mucous lining, and lessening abnormal secretions.

Therapeutical.

Pareira is used in various chronic bladder affections, but it seems to be very uncertain in its action, clinical evidence of its special efficiency not being forthcoming.

OPIUM.

Local Action.

Physiological.

It seems very doubtful whether opium can be absorbed through the unbroken cuticle. We are told that opium inspectors in India will remain for hours with their arms plunged up to the elbows in the inspissated extract, and that no narcotic effect is produced; but it is difficult, on the other hand, to believe that opium is entirely devoid of a property which belladonna possesses in so remarkable a degree. Sir Henry Thompson is also strongly of opinion that the bladder cannot absorb opium; but on this point more precise evidence is wanting.

Therapeutical.

Fomentations with the decoction of poppy-heads, and with other preparations of opium, have long been recognised as efficient means for the relief of pain in various inflammatory conditions, as hæmorrhoids, erysipelas, conjunctivitis, &c.; but as we cannot bring forward evidence of absorption of the drug, we must merely attribute this soothing influence to the thorough application of moist heat.

Internal Action.

Physiological.

I. *On Nervous System.*—1. *Brain.*—In small quantity, or in lesser degree as the occasional preliminary action of a truly narcotic dose, opium is gently exciting to the brain, the intellectual faculties be-

Therapeutical.

I.—1. Opium, being the most certain narcotic known, is very largely prescribed in a great variety of cases. In simple insomnia, in worn-out conditions of the nervous system, in acute fevers, such

coming generally stimulated, and the imagination more vivid. To this, however, rapidly succeeds a dulling or deadening effect, drowsiness supervenes, and deep sleep finally sets in, from which the patient wakes within a period of time proportioned to the quantity of the drug administered. Headache, dryness of the mouth, and digestive disturbance are frequently experienced, and idiosyncrasy may in some rare cases interfere materially with sleep by bringing into special prominence the exciting or stimulating properties of opium. It is not quite clear in what precise way the narcotising influence is in this instance produced; but analogy would lead us to believe that contraction of the cerebral vessels imitates natural sleep by inducing an anæmic condition of the grey matter of the brain. This might appear to be contradicted by the deep cerebral congestion noted in the victims of opium poisoning; but Hammond has shown by experiment that whilst the brain is anæmic in sleep caused by a large dose, as the as typhus and typhoid, where delirium and sleeplessness constitute truly dangerous complications, in delirium tremens, in the later stages of severe small-pox, in meningitis, acute mania, and in numerous other diseased conditions which the reader can readily recall, this invaluable drug does most essential service by procuring sound and refreshing sleep. It would clearly be outside the scope of this little book to go into any exhaustive discussion on the varied uses of opium as a narcotic in disease, and we must refer our readers to the numerous and excellent works on the practice of medicine.

slumber passes into coma, engorgement of the veins sets in. The resulting contraction of the pupil is probably central in origin, as it cannot be produced by any local application of opium in any form.

2. The conductivity and irritability of the sensory nerves are much diminished, so that pain is felt with less intensity.

2. And even when not given in truly narcotic doses, it may also lull the sufferer into slumber by benumbing the sensory nerves and removing pain. As a sedative, anodyne, or analgesic, it is indispensable in many painful conditions, such as neuralgia, sciatica, cancer, biliary or renal calculi, labour after-pains, colic, &c., and, as we shall presently see, the subcutaneous injection of morphine is the most effectual, as it certainly is the most rapid and convenient, mode of obtaining this action of the drug.

Opium is also an excellent antispasmodic, and acts well by relieving irregular muscular contraction, as in the intestine causing colic, in the uterus tending to abortion or exhausting after-pains, in spasmodic urethral stricture; and its remarkable influence

3. The reflex function of the spinal cord is at first slightly increased, but subsequently becomes lessened in degree, and the respiratory centre is weakened and finally paralysed. In cold-blooded animals, as the frog, in which the cerebral are subordinated to the spinal functions, opium causes most violent tetanic convulsions, and this has been observed in children.

4. The sympathetic system of nerves is also primarily excited, and secondarily depressed.

II. *Vascular System.*— The action of the heart is at first slightly quickened, but afterwards its beats become slower, the pulse fuller and firmer, and the arterial tension is raised, this effect being considered due to an influence on the cardiac inhibitory nerves. It is noted, however, that shortly before death, in cases of opium poisoning, the pulse becomes feeble, rapid, and irregular. The stimulating over certain forms of obstinate ulceration must also be due to some nervous influence.

3. Opium, having the property of arresting the muscular action of various organs, is our sheet-anchor in those terrible cases where rupture of the intestine, bladder, or uterus has occurred, and where the only possible chance of recovery consists in the most perfect rest of the viscus, encouraging the healthy process of repair, and preventing the escape of irritating secretions into the peritoneal cavity.

II. The subcutaneous injection of morphine has been advised by Dr. Clifford Allbutt in angina pectoris, palpitation, and various painful cardiac conditions. Its contracting influence on the small vessels explains the antiphlogistic effect of opium in cases of peritonitis and other inflammatory conditions, as well as its power of checking coryza in its early stage. It also acts well as an astringent in some

action on the sympathetic nerves causes some contraction of the smaller vessels to accompany the use of moderate doses of opium.

III. *Respiration and Temperature.* — The breathing tends to become slow from the paralysing influence of opium on the respiratory centre, and at the same time the secretion from the bronchial tubes is lessened.

The temperature at first rises a little, but finally falls when sweating is established.

IV. *Digestive and Secreting Organs.*—1. Nausea occasionally follows the use of opium, and constipation invariably results from diminution of the intestinal secretions, no less than arrest of the peristaltic movement of the canal.

2. The salivary secretion

forms of hæmorrhage, and more especially that from the lungs.

III. Opium is the most soothing remedy for coughs of all kinds, but more especially that of phthisis. It is a valuable aid in spasmodic asthma and the early stages of acute pneumonia, but in the later stages we must beware of its power of checking secretion, and in bronchitis it may do harm by slowing the respiratory movements, causing sleep to interfere with the due emptying of the bronchial tubes, and thus leading on to imperfect aëration of the blood and final suffocation.

IV.—1. Opium is an excellent astringent in diarrhœa, dysentery, and British cholera, often succeeding where other remedies fail, and for the relief of pain and tenesmus nothing is better than the enema of the Pharmacopœia. In the diarrhœa of ulcerative processes, such as typhoid and phthisis, and the later stages of dysentery, it is truly invaluable.

is also diminished, causing dryness of the tongue.

3. The urine is lessened in quantity, but opinions differ as to the effect produced on its solid ingredients.

3. Opium is of great service in some cases of diabetes, checking the craving appetite, and lessening the secretion of sugar.

We must beware of its use, however, in advanced cases of renal disease, where it acts injuriously by checking secretion and encouraging the retention of urea in the blood.

4. The biliary secretion is checked.

5. The secretion of the skin is increased, perspiration usually resulting, and we may say generally that opium checks all secretions but that of the skin.

5. Opium in some forms, and more especially Dover's powder, acts as an efficient diaphoretic, but, curiously, it has an opposite effect in phthisis, where it has been used with success to check night sweats.

Elimination takes place by the breath, sweat, urine, milk, &c.

We must remember the elimination by the milk in prescribing opium to suckling mothers.

Poisonous Action.—When opium has been given in a poisonous dose, the resulting sleep gradually grows deeper, the breathing becomes heavy and stertorous, the face is flushed, swollen, and dusky, the pupils contracted to mere points; distension of the right

Antidotes.— When summoned to a case of opium poisoning, the first indication must be to evacuate the stomach, and this is best effected by the stomach-pump, as the vomiting centre is too much paralysed by narcosis to allow of its effective stimulation by

side of the heart still further prevents the return of blood from the engorged lungs, and paralysis of the respiratory centre finally causes death by suffocation. Much difficulty may occasionally attend the diagnosis of opium poisoning from (1) alcoholic coma, where, however, the pupils are usually dilated; (2) from uræmic coma, where an examination of the urine, if practicable, might clear up our doubts; and (3) from apoplectic effusion in the pons Varolii, where the symptoms are usually so similar as to render an absolute diagnosis, under certain circumstances, impossible. After death we find well-marked congestion of the brain.

emetics. We then try to counteract the tendency to sleep by cold affusion, irritation of the skin, strong coffee, galvanism, and walking the patient about, and finally we may cautiously use atropine as the physiological antidote. Although some good evidence comes to us from China of opium poisoning checked by the antagonistic action of atropine, reports and opinions differ much on this head, and some authorities hold that atropine in certain proportions may even intensify the action of morphia.

Professor Bennett believes that atropine may be of service by contracting the vessels of the brain, and limiting the tendency to cerebral congestion.

As a last resource, we may have recourse to artificial respiration.

Cautions and Modes of Administration.

In giving opium, we must remember that human beings, like the lower animals, are diversely susceptible to its influence. Thus ducks and pigeons can swallow large quantities with impunity, whilst the horse and the dog rapidly fall under its influence; and although we can hardly lay down any general rules to guide us in practice, we shall find that some persons

can take very heavy doses, whilst others are poisonously affected with unexpected rapidity. We must specially remember that children always bear opium badly, one drop of laudanum having proved fatal to an infant; that anæmic persons also are said by Traube to be readily susceptible. To guard ourselves as far as possible from risk, we shall do well to begin with a moderate dose, and invariably to ask our patient whether he has ever taken it before.

As the system seems rapidly to accustom itself to the use of opium, we require gradually to increase the dose, and so completely do persons habituate themselves to the pleasurable sensations derived that they willingly brave the resulting languor and digestive disturbance, and take it in enormous quantities. De Quincey used to take as much as 320 grains daily, and from half a pint to a pint of laudanum is by no means an uncommon daily allowance. Although the Turks, Chinese, and Hindoo races are the principal victims of this habit, much opium is also consumed in this way in some parts of England, and moderate opium-eaters abound in all ranks of society. We must therefore be very careful to warn our patients from time to time of the absorbing nature of this practice, and of its enervating effects on mind and body; and although it seems evident that good health is not altogether incompatible with moderate opium-eating, and that its use by smoking is far more deleterious, still there is abundant evidence of the general lowering tendency of the habitual use of this drug as an act of mere self-indulgence.

As regards the various pharmaceutical preparations of opium, when we wish to produce sleep we generally prescribe the tincture in a medium dose of ℥xxx., the pil. sap. co. (gr. v.), or the extract (gr. j.); whereas, if we merely wish to relieve pain, smaller doses may prove sufficient.

The astringent action is best secured by small doses, which bring the stimulant properties of the drug into play; and an incipient coryza may often be checked by 5 or 10 minims of laudanum taken at bed-time.

For diaphoretic purposes the combination with ipecacuanha, as in Dover's powder (pulvis ipecacuanhæ compositus, gr. x.), is of service; and for the relief of diarrhœa we also call to our aid the astringent properties of chalk and kino, as in the pulvis cretæ aromaticus cum opio (gr. xx. to xl.), and the pulvis kino compositus (gr. xx.); or the enema opii may be soothing both in this condition, and as allaying, by nervous sympathy, various painful conditions of the uterus and bladder.

As an adjunct to cough mixtures, and as forming their really effective ingredient, we most conveniently prescribe opium under the form either of the tinctura camphoræ composita (mxx. ad ʒj.) or of the tinctura opii ammoniata (mxx. ad ʒj.), as in Prof. Christison's well-known formula :—

℞ Syrupi scillæ ℥ij.; aq. menth. pip. ℥ij.; tincturæ opii ammoniatæ ℥ss.; tincturæ lavandulæ compositæ ℥ss.; syrupi ʒj. ℥ss. ter die.

In diabetes we must push the drug boldly, to the extent even of from 6 to 8 grains a day.

The many-sided actions of opium which we have just described are due to its complex constitution and to the large number of alkaloids which it contains. Of these, morphine is by far the most generally used, and in the form either of the hydrochlorate or the acetate, but more especially of the former, it has in very considerable measure superseded the crude drug on which we were formerly obliged to depend. Its principal differences from opium are as follows :—

It is less astringent and antiphlogistic, and, by interfering less with secretion, its use is not attended by so much headache, constipation, and dryness of tongue. It is more directly narcotic and anodyne, and is therefore a more convenient remedy when we wish merely to promote sleep or to relieve pain.

Its bulk is smaller than that of opium, and it is devoid of smell.

The action of the heart becomes slower, and the arterial tension is raised.

The respiration may become irregular from a depressing action on the vagi.

The functions of the spinal cord are stimulated, and hence we occasionally meet with restlessness and muscular twitchings, which in some of the lower animals run on into true convulsions.

Irritability of the bladder is often observed, and troublesome itching of the skin, depending, in some cases, on the development of a minute papular or vesicular eruption. Some years ago a favourite mode of using morphine was by what is known as the *endermic* method, in which the powder was sprinkled over the raw surface of a blister; but this has now been almost entirely superseded by the hypodermic syringe. This ingenious little instrument enables us to inject a small quantity of morphia in solution beneath the skin, and the relief to suffering is usually immediate, and sometimes permanent. It matters little whether we introduce the remedy into the immediate neighbourhood of the painful spot, our only caution being to avoid the vicinity of large blood-vessels or nerves, and to plunge the nozzle of the syringe fairly through the skin into the adjacent cellular substance. Some smarting usually follows the entrance of the fluid, and inflammation and abscess may occasionally be produced; but these accidents are rare, and the sting of the primary puncture may readily be obviated by freezing the skin with ether spray. These injections are now very largely practised for the relief of pain, and more especially in facial neuralgia, sciatica, lumbago, in the passage of biliary or renal calculi, in cancer, and a vast range of diseases in which acute suffering is the main symptom, we are enabled to give our patients temporary and sometimes permanent relief. So great, indeed, is the popularity of this mode of treatment, that a new school of opium-eating, so to speak, has been formed, and morphia injections have unfortunately been practised to a great extent as a mere development of self-indulgence. We must, of course, be very careful not to give even the most casual or indirect encouragement to such disastrous habits.

Some caution is always requisite in prescribing these injections for the first time, as not only severe sickness and vomiting have followed their use in many cases, but great prostration, with failure of the heart's action, and even death. We must therefore carefully watch our patient for some time after the completion of the little operation. We must never begin with a larger quantity than the sixth of a grain; and we are told, on good authority, that the combination of $\frac{1}{20}$ of atropine to one part of morphine will effectually obviate all risk of these unpleasant consequences. For injection we may use the injectio morphinæ hypodermica, containing 1 gr. of the acetate in every 12 minims, remembering that morphine acts in this way three times more powerfully than when taken by the mouth. For internal use we may prescribe either salt in doses as from $\frac{1}{8}$ gr. to 1 gr., remembering, however, the varying susceptibilities of different persons, and the fact that so small a quantity as half a grain has caused death: or we shall find the liquor morphinæ hydrochloratis or acetatis, containing half a grain to the drachm, a convenient preparation. It is of the highest importance that all hypodermic solutions should be freshly prepared, as they very readily decompose, and thus cause irritation.

The B. P. has now added *morphinæ sulphas* and the *liquor morphinæ bimeconatis*, an excellent preparation, and often well borne by patients who cannot take morphia in other forms. Dose, 5 to 40 minims. The B. P. contains the injectio apomorphinæ hydrochloratis, composed of gr. ij. ad aquæ camph. ℥ l.

Many of the other alkaloids contained in opium are merely subjects for physiological curiosity.

1. *Codeina* or *codeia*, however, is now frequently used, not for its narcotic properties, which are feeble and transient, but for an undoubted soothing influence which it exerts over various painful affections of the kidney. It is also an established remedy in cases of diabetes, checking the secretion of sugar, and arresting, in some cases, the progress of the disease.

Its great advantage over opium is, that it can be freely pushed without causing narcosis. We may give gr. $\frac{1}{4}$ to gr. 2 thrice a day until drowsiness supervenes, or the sugar disappears, and from gr. x. to gr. xv. have been daily administered with benefit.

2. Narceine possesses only one-eighth of the narcotic properties of morphine, and is never used in medicine.

3. Cryptopia is one-fourth as powerful as morphia, and in addition to its hypnotic properties it causes in the lower animals peculiar illusions of vision, with a tendency to convulsive action. It also is never used.

4. Thebaia is purely excitant, and in doses of 1 grain it causes tetanic spasms.

5. Narcotina has no narcotic properties, but has some power as an antiperiodic.

6. Papaverine is narcotic.

7. Meconine is feebly narcotic.

Apomorphine, which is prepared from morphine, is a powerful emetic, occasionally used by subcutaneous injection, in doses of $\frac{1}{16}$ gr.

NARCOTICS AND ANODYNES.

Narcotics, as the name implies, are those remedies which cause sleep, and they do so by imitating the normal physiological arrangement of that condition and producing an anæmic state of the cerebral hemispheres. Why they act in this selective way on the brain is not very clear; for although opium contracts the blood-vessels, thus arresting nearly all secretion, chloral has a dilating effect, and pot. bromid. has not been proved to have any special action on the circulation at all. Bernard's theory of independent vascular areas acted on by special drugs only removes the difficulty further back, as, of course, we are totally unable to explain why one drug affects one region or function, and another another. But, whatever

the explanation may be, we all gratefully acknowledge the enormous benefits derived from the control over the reparative process of sleep which these remedies afford us, and a reasonable mode of division seems to be into—1st, direct narcotics; 2nd, indirect narcotics. As a general rule, we must exhaust all the resources of class 2 before we have recourse to class 1, remembering the fascination which these drugs exert and the pitiable condition of slavery to which they reduce their victims.

1. Direct Narcotics.

Physiological.

These are the following drugs, named in their order of potency, as opium, chloral hydrate, paraldehyde, chloroform, potassium bromide, hyoscyamus, belladonna, hop, and Indian hemp. The peculiar action of chloral, however, occasionally causes its failure in cases of debility, where it acts by increasing the natural tendency of the relaxed arteries to dilate, thus flushing the brain with blood during recumbency, and effectually preventing sleep.

We must also remember the depressing influence of chloral on the heart's action. In prescribing narcotics, we must very carefully study the individual peculiarities of our patients, and prescribe our first dose of any member of

Therapeutical.

Opium is, beyond doubt, the most potent and certain, and, perhaps, least dangerous narcotic; but the digestive disturbance unhappily following its use often interferes with its continued administration. It is, no doubt, best adapted of all the remedies of this class for use in fevers, because it does not depress the heart's action, and in all painful conditions, on account of its anodyne properties. Chloral is more to be recommended in simple insomnia, in delirium tremens, and in all cases where we wish to keep up a prolonged narcotic effect, as it is not requisite, as a general rule, to increase the dose. Bromide of potassium is well adapted to soothe the system, when over-excited by

the group with caution. Some people bear opium badly, and are furiously excited by doses which usually prove narcotic. Chloral sometimes causes faintness and nausea, bromide of potassium now and then fails in its effect, so that we require to feel our way with scientific timidity.

worry or overwork, and the others are occasionally useful when success has not been attained by other means.

2. Indirect Narcotics.

Physiological.

First on this list we must place those drugs which secondarily affect the brain circulation by toning up the arteries, and thus regulating the supply of blood. Digitalis is here all-important; and iron, also, has its place, by improving the quality of the blood. A little alcohol, given at the right time, will often produce sleep; and it is well known that the state of exhaustion produced by an empty stomach will often lead to prolonged wakefulness, only to be removed by a little food. Tea and coffee taken late at night often prevent sleep.

Darkness and quiet and warmth promote slumber, and the opposite condition of cold is well known to cause a

Therapeutical.

Digitalis often acts very efficiently, as a narcotic, by removing that relaxed condition of vessel which substitutes congestion for anæmia, when the patient lies down; a little alcohol, at bed-time, more especially for the aged, is an excellent 'night-cap,' and when we find weakly persons complaining of want of sleep, we shall do well to order a cup of milk or a little beef-tea, or other simple nourishment, to be taken at bed-time, or placed by the bedside for use in the early morning hours, when the powers of life begin to flag.

Suitable bedroom arrangements are very important, as some persons are at once awakened by the faintest ray

comatose condition, too often ending in death. Sleep, again, is promoted by the removal of everything which prevents it.

Thus, hyoscyamus or conine, or atropine, by stilling the wild ravings of mania, may be truly narcotic, and the next class of remedies are often effective members of the major group, by lulling or removing pain, which made sleep impossible.

of light. Some like a hard bed, others a soft, according to their personal habits, and we must carefully regulate the blanket coverings according to the season of the year. Cold feet often cause insomnia, and a hot-water bottle will be found of service in winter; whilst an open window seems essential in some cases before sleep can be obtained.

Wakefulness may be the result of too low a pillow, the head being nearly on the same plane as the body, and the blood encouraged by flaccid vessels to flush the brain, and some persons have a superstitious feeling, which is probably worthy of encouragement, that the bed should invariably be placed north and south.

In some cases of sleeplessness, cold to the head, combined with a hot foot-bath, has proved successful.

These drugs have done good service in asylum practice.

Anodynes.

Physiological.

Anodynes act by lulling pain, probably by interfering

Therapeutical.

Of all anodynes opium is the best, and more especially

with the conducting power of sensory nerves. Opium possesses this power, which is absent in chloral, and then we have aconite, belladonna, chloroform, &c., which may soothe locally as well as constitutionally.

morphia by subcutaneous injection, which rarely fails to lessen, and often speedily to remove, pain; chloral only removes pain during sleep, but curare is probably a true sedative. Local application of anodynes is serviceable in acute inflammation, neuralgia, rheumatism, &c.

MUSTARD.

Local Action.

Physiological.

Mustard applied to the skin causes a vivid redness, with violent smarting and itching, and, if the application be continued too long, vesication may follow, and even troublesome ulceration.

Therapeutical.

Mustard is used, firstly, for the relief of pain, and there can be no doubt of the benefit thus derived in many nervous, rheumatic, and inflammatory affections. In neuralgia, lumbago, sciatica, pleurodynia, pleurisy, pneumonia, peritonitis, colic, and a vast variety of painful disorders, we may expect to alleviate suffering in some measure by the use of sinapisms, and at other times we use this mode of drawing blood to the surface, and so relieving the congestion of deeper parts, on the principles referred to under the heading of 'Counter-irritation.'

Mustard poultices are most valuable in arousing

patients from the dangerous comatose condition into which they occasionally drift in the course of some of the acute inflammations; and sinapisms applied to the feet and calves are of service in the stupor of narcotic poisoning and in uræmic coma.

Mustard baths may be employed to bring back the eruption of some abortive cases of the exanthemata, or as a stimulant in acute bronchitis or in the convulsions of children.

Constitutional Action.

Physiological.	*Therapeutical.*
Digestive Organs.—Mustard increases the appetite by irritating the mucous membrane of the stomach, but does not increase the secretion of gastric juice.	Mustard is extensively used as a dietetic condiment.
It acts as a prompt and effectual emetic of the direct class.	This emetic power is of great value in cases of poisoning, as mustard is always at hand, and can be used at once.

Mode of Administration.

A mustard poultice must be made with cold water, for we know that hot water dissipates the volatile oil on which the counter-irritation depends, vinegar destroys it, and alcohol prevents its formation. It must be kept on from twenty minutes to half an hour, according to circumstances.

SENEGA.

No external or local action has been described.

Constitutional Action.

Physiological.

The principal action of senega is that of stimulating the mucous membrane of the bronchial tubes, and possibly, by a tonic influence on their muscular tissues, facilitating the expulsion of their contents. It has also been accredited with diaphoretic, diuretic, and emmenagogue properties, but is seldom employed in any other capacity than as an expectorant.

Therapeutical.

Senega is of great service in the more chronic conditions of pneumonia and bronchitis, where it seems to help the patient to get rid of the large quantities of secretion frequently accumulated within the lungs. Theoretically at least, its stimulating properties would contra-indicate its use in the more acute pulmonary affections; but in the later stages of bronchitis, and more especially those cases occurring among the very old and young, it is of real value.

Dose and Mode of Administration.

The infusion is the preparation most commonly employed, and it is generally combined with carbonate of ammonium and other expectorants. Thus:—

℞ Ammonii carbonatis gr. iv.; tincturæ scillæ ɱxv.; tincturæ camphoræ compositæ ɱxxv.; extracti glycyrrhizæ gr. v.; infusi senegæ ad fl. ℥j. Misce, fiat haustus ter die sumendus.

EXPECTORANTS.

These are remedies which facilitate in various ways the expulsion of secretions from the bronchial tubes. They may thus be divided :—

Physiological.	*Therapeutical.*
1. The emetic class, which are the most efficient of all, removing and softening the mucus, causing the transudation of watery fluids, and relaxing the muscular walls of the bronchial tubes.	1. There can be no doubt that when the lungs are choked with secretion, a good emetic often acts like a charm, as in bronchitis, whooping-cough, &c. We must here use the indirect emetic agents, as am. carb., ipecacuanha, &c.
2. Nauseants may also be of service as expectorants.	2. These are merely the indirect emetic drugs given in small doses, as antimony, ipecacuanha, &c.
3. We then have what are called the stimulating expectorants, acting either on the general vascular system, or specially on the nervous and muscular structures of the lungs.	3. These are senega, am. carb., &c.; but it is evident that any tonic or stimulating remedy may frequently act indirectly as an expectorant, by improving the tone of the circulation and giving the patient strength to cough and clear his lungs. The stimulating expectorants are more especially used in the later stages of pulmonary disease.
4. Those remedies which promote secretion from a dry	4. In the earlier stages of bronchitis much discomfort

and swollen mucous membrane.

occurs from the dry hard cough and difficulty of breathing arising from swelling of the bronchial mucous lining. Great relief is experienced when free expectoration is established, and this may be promoted by inhalation of steam, liq. am. acet., lobelia, and the class of nauseants generally.

5. Expectoration is often rendered difficult by tenacity of the mucus, which is coughed up only after much straining and effort, and great relief follows every drug which can thin or liquefy the secretion.

5. We find that alkalies act well here, and, if any gouty tendency exists, more especially pot. iod.

6. Spasmodic contraction of the smaller bronchial tubes may interfere with free expectoration.

6. Here we may hope to obtain relief by the use of opium, belladonna, stramonium, tobacco, &c.

KRAMERIA (RHATANY).

Krameria has powerful astringent properties, due, no doubt, to the tannin which it contains.

Rhatany has been used with success in dysentery and diarrhœa, but is probably inferior to many other remedies of the same class, and is therefore but seldom employed.

LINSEEDS—SEEDS, MEAL, OIL.

Local Action.

Physiological.

Linseed meal, in the form of poultice, is the most convenient and effectual way of applying continuous moist warmth to the surface of the body. Thus used, it relieves pain, relaxes spasm, and is generally soothing and agreeable to the feelings of the patient. By relaxing the superficial vessels, a poultice may be in some measure antiphlogistic, and may also relieve the congestion of internal organs by drawing blood to the cutaneous surface and promoting perspiration there.

Therapeutical.

A linseed poultice is a very soothing and effectual application in all acute affections of the lungs. Not only does it relieve pain, but it keeps up a warm equable temperature, and rests the affected organ by restricting in some degree the movements of the chest walls. It may also be used with advantage in peritonitis, in colic, in various inflammatory affections of the throat, and in boils, abscesses, &c., where if it does not succeed in arresting the suppurative process, as occasionally happens, it facilitates and hastens the breaking down of inflammatory products into pus, and thus encourages the process of ripening. After the opening of the abscess poultices cannot be recommended, as they are nauseous and dirty, and we would much rather advise the case to be treated on the antiseptic principles of Mr. Lister.

Linseed oil is an old-

fashioned treatment for burns, and combined with lime-water was formerly extensively used under the name of carron oil.

Internal Use.

An infusion of linseed is rather soothing in character, probably owing to the mucilage which it contains.

Under the name of linseed tea, this infusion is much used in domestic medicine as a soothing remedy for coughs.

Mode of Administration.

When used as an application in pleurisy or pneumonia, a poultice must extend fairly round the chest, must be at least half an inch thick, and must be changed not seldomer than every two hours, as it soon tends to become dry, hard, and uncomfortable. It is best made by slowly sprinkling the meal into boiling water until the necessary consistence is reached, stirring diligently meanwhile to prevent the formation of hard lumps, and afterwards incorporating with it a certain amount of olive oil which prevents it adhering to the surface. Occasionally its use seems to irritate the skin, and cause a crop of small boils and painful pustules, and it must therefore, as a general rule, be avoided in moist cutaneous affections.

COTTON-WOOL.

This useful substance is employed in various inflammatory conditions, with the view of excluding air, and supplying warmth and slight support. Thus in burns, and more especially in those of a superficial nature, the immediate application of a thick layer of cotton-wool relieves the smarting pain and promotes recovery; and the same treatment may be recommended to a blister after the watery fluid has been removed

from the bulla. In acute rheumatism, also, the patient may derive much relief from the careful and equable encircling of his inflamed joints with cotton-wool, secured in position by a few turns of flannel bandage.

It is also believed by some aurists to form the best material for the construction of an artificial membrana tympani, and absorbent cotton-wool is a serviceable material.

COLLODION.

Physiological.

Collodion is used to fulfil two indications.

1. To exclude the action of the air from inflamed parts, and to prevent the patient from scratching and irritating the surface.

2. To exert a moderately astringent effect from the contraction which follows its drying, and the gentle compression of any tissue or organ which can thus be exerted may be of great service in checking inflammatory conditions. Mr. Gamgee praises its use highly in orchitis, where it should be freely painted over the testicle and cord.

Therapeutical.

1. For this purpose it is used to paint over the pustules of small-pox, in the hope of preventing pitting. Also in herpes zoster and in erysipelas it may be applied with advantage.

2. Dr. Hare tells us that, at the very early or papular stage of a boil, we may avert subsequent suppuration by the application of collodion.

Sir D. Corrigan recommends sealing up the extremity of the prepuce by collodion to remedy the nocturnal form of incontinence of urine in children; and it may be of service in hæmorrhage depending on capillary oozing, and more especially in the troublesome bleeding frequently following leech-bites.

Finally, its application may facilitate the healing process in small cuts and wounds, as after the operation of harelip, and in the troublesome condition known as cracked nipples. Under all these conditions the best results may be obtained by using the flexile collodion, in which the combination with castor-oil prevents the too rapid cracking or peeling away of the protecting film.

Under the name of styptic colloid, Dr. Richardson has introduced an efficient remedy for checking capillary oozing and promoting the healing of slight wounds. It is thus composed :

Collodion	100 parts.
Carbolic acid	10 parts.
Tannin	5 parts.
Benzoic acid	5 parts.

Collodium flexile is made with Canada balsam and castor-oil, and *collodium vesicans* is now an official preparation.

Flexile collodion and chrysophanic acid form a good combination, and Mr. Carteighe tells me that flexile collodion with salicylic acid and extract of Indian hemp is an excellent application to soft corns.

AURANTII FRUCTUS, CORTEX, ET FLORIS AQUA.

The various preparations of orange require no detailed comment, for beyond the fact that those made from the rind are mildly tonic in virtue of their bitterness, and that the syrup and the orange-flower water are agreeable flavouring additions to a prescription, we have no evidence of their special therapeutic properties, if any exist.

LIMONIS CORTEX, OLEUM, ET SUCCUS.

Lemon-peel is in some measure tonic and antispasmodic, and is a useful flavouring ingredient, but lemon-juice has some important properties which are purely therapeutical, and cannot be explained by any action which it possesses over the healthy organism.

In the first place we must rank its antiscorbutic virtues, acting as it does both by preventing and by curing the disease, and by its universal use afloat almost stamping out the ravages of what used to be an almost invariable attendant on long voyages at sea. The occurrence of scurvy to any extent on board ship is now looked upon as a clear indication that the regular administration of lime- or lemon-juice has been neglected, and that the crew has been attacked by a painful and dangerous disease, the absolute preventibility of which experience has amply confirmed. Various explanations have been given of the cause of scurvy, and there is no doubt that it is usually associated with an absence of fresh meat and vegetables from the diet scale. Dr. Garrod, however, goes further, and teaches that the essence of the disease lies in a deficiency of the potassium salts; whilst Mr. Morgan, of Dublin, is no less convinced that the absence of phosphoric acid is the real cause —both agreeing in this, however, that the presence of this

special ingredient in lemon-juice explains its superiority over citric acid, which is in no degree an antiscorbutic. It is unfortunate that lime-juice is bulky and liable to become solid at low temperatures, and must be also administered in such considerable doses as to give some excuse for its occasional neglect on expeditions where every ounce of extra weight entails increased toil and danger. It is to be hoped that some more convenient and portable means of using this invaluable drug may yet be introduced.

Lemon-juice was formerly vaunted as a specific for acute rheumatism, and although this has not been confirmed by experience, there is no doubt that persons afflicted with chronic rheumatic pains may often derive benefit from taking a tablespoonful of this agreeable remedy two or three times a day with their meals. Lemon-juice has also been called a refrigerant, but its sole claim to this title until lately has rested upon the great facility with which we may construct refreshing effervescing draughts by its aid. Quite recently, however, some good authorities have praised it highly as an antipyretic in ague, given as a decoction of the freshly plucked fruit.

INDIAN BAEL (BELÆ FRUCTUS).

Indian bael, containing tannin, has astringent properties, and has been highly praised as an effectual cure for the more chronic forms of dysentery. Only partial confirmation is given by home experience to the evidence furnished from abroad; but this may be explained not only by the limited opportunities of testing its efficacy in this country, but because the drug is probably much more active when used in a perfectly fresh state.

OIL OF THEOBROMA,

being a firm, solid, and agreeable substance, is much used in the manufacture of suppositories.

GAMBOGE.

Local Action.

Gamboge has no local action, and differs from some other remedies of the same class by not exerting its purgative effects when applied to a raw surface or injected into the cellular tissue.

Constitutional Action.

Physiological.

On the Digestive and Secreting Organs.—Gamboge exerts a good deal of irritating effect, acting more especially on the small intestine, and producing the discharge of large quantities of watery fluid. If given in sufficient quantity, inflammation and ulceration of the stomach and intestines may supervene, and death has followed the administration of a single drachm of the powder. It is also usually looked upon as a diuretic, but no trustworthy evidence has been given of its efficacy in this direction.

Therapeutical.

Gamboge is a drastic (hydragogue cathartic), formerly much used where free purgation of watery fluid seemed to be indicated, as in cardiac dropsy, but it is not only disagreeable and irritating, but uncertain, and has therefore been in great measure superseded by other remedies on which more dependence can be placed. It has been shown by Rutherford to stimulate the intestinal glands, but not the liver.

Absorption, Mode of Elimination, &c.

In order to insure its full absorption, it seems necessary that gamboge must be previously dissolved in the bile, as we have seen that local application does not produce any purgative effect. It is, of course, thrown out in great measure by the

intestines, but the colouring matter is excreted by the urine, to which it imparts a bright yellow tinge.

Mode of Administration, Dose, &c.

The great objection to the use of gamboge is its uncertainty, as we can never precisely foresee the cases in which it will cause troublesome vomiting and purging. To try and obviate this, therefore, as well as to conceal its acrid taste, we generally combine it with other drugs; but on the whole I think I am justified in saying that it has no therapeutic advantage which cannot be obtained more conveniently and agreeably by the use of other purgative drugs.

We may most conveniently prescribe the compound pill which contains gamboge, aloes, cinnamon, hard soap, and syrup, and of which the dose is from 5 to 15 grains.

BUCHU.

Physiological Action.

The physiological action of buchu is principally, if not entirely, expended on the mucous membrane of the genito-urinary organs. It is probable that the volatile oil which it contains, being rapidly taken into the blood and as rapidly excreted by the kidneys, acts locally through the urine on the lining membrane of the bladder and urethra.

The urine is impregnated with the peculiar odour of the drug, and is perhaps slightly increased in quantity.

Therapeutical.

Buchu has long been valued by surgeons as a useful remedy in chronic catarrh of the bladder and the various mucous discharges from the genito-urinary organs, depending on a relaxed condition of the affected parts.

CUSPARIA.

This is a light tonic, rarely used.

QUASSIA.

Physiological.

The action of quassia is directed to the gastro-intestinal mucous membrane, and it is probable that its intensely bitter taste may stimulate the secretion of gastric juice, as it certainly increases the appetite.

Quassia is destructive to many of the lower forms of animal life.

Therapeutical.

Quassia is much used as a tonic in dyspepsia, want of appetite, and general debility. Having no aromatic flavour, it is sometimes badly borne by weak stomachs, but being very cheap, it is largely prescribed in dispensary practice, more especially in combination with iron.

It is therefore of service, given as an enema, for the destruction of thread-worms.

MASTICHE.

This is only used as a filling for decayed teeth in dental surgery.

MYRRH.

Local Uses.

Physiological.

Myrrh is astringent, and checks excessive secretion from mucous surfaces.

Therapeutical.

It is a useful addition to gargles in relaxed or ulcerated conditions of the throat; it is

a good application to spongy or unhealthy gums, as in mercurial salivation; and it often forms one of the active constituents of lotions for foul ulcers, where it gently stimulates the granulating surface and corrects the fœtor of discharges.

Internal Uses.

Like all the gum balsams and resinous substances, myrrh may possess in some degree the power of stimulating mucous surfaces. Tradition and the habit of prescribers have also invested it with some supposed influence over the uterus; but no trustworthy evidence has ever been brought forward on this point, and it is more than probable that its emmenagogue influence is quite secondary to the other drugs in combination with which it is prescribed in these cases.

Myrrh has occasionally been used as a stimulant in chronic bronchitis, but practically its application in medicine is now restricted to the administration of the various forms of pill in amenorrhœa; and here it is impossible to separate its action from the aloes with which it is invariably combined.

℞ Aluminis ʒij.; tincturæ myrrhæ ʒij.; infusi rosæ acidi ad ℥x. Misce, fiat gargarisma.

GLYCYRRHIZA (LIQUORICE ROOT).

This is used as a flavouring ingredient, and as a basis for powders and pills. The pulv. glycyrrhizæ comp. of the B. P.,

in which sulphur now appears for the first time in combination with senna and fennel, is an excellent mild aperient. Dose 30 to 60 gr.

TRAGACANTH

is of service as a vehicle for the suspension and division of various powdered drugs, and is principally used under the form of the pulv. tragacanthæ co., gr. 10 to 60.

There is also a mucilage, and the B. P. has now inserted the glycerinum tragacanthæ.

SCOPARII CACUMINA (BROOM TOPS).

No local action has been described.

Constitutional Action.

Physiological.

Scoparium has some influence over the digestive and secreting organs, causing, in large doses, vomiting and purging, but in smaller increasing very considerably the urinary water. Two active principles have been extracted from the drug, regarding whose physiological actions some difference of opinion exists. Thus scoparine is believed by one class of observers to be the diuretic factor in broom-tops, whilst others assert that it has no such property. Sparteine has also been very variously de-

Therapeutical.

Scoparium is an excellent diuretic, and largely used for the purpose of removing dropsical accumulations. If we can succeed in stimulating the kidneys effectually by a combination of this and other drugs, we may hope to hold in check and disperse the anasarca of cardiac and chronic kidney disease, and to aid the removal of the watery fluid of hydrothorax and ascites.

scribed, but the balance of testimony goes to show that it has very definite toxic powers, lowering the reflex action of the spinal cord, paralysing the motor nerves, suspending the electrical excitability of the vagus, and finally causing death by respiratory paralysis.

Dose and Mode of Administration.

Scoparium is seldom prescribed alone, but is most usually made the basis of diuretic mixtures, on the well-known principle that combination here is of essential service.

℞ Potassii acetatis ʒjss.; aceti scillæ ʒiv.; decocti scoparii ad ℥vj. Misce, fiat mistura. Capiat unciam unam quartis horis.

℞ Tincturæ digitalis ♏x.; spiritûs ætheris nitrosi, spiritûs juniperi, āā ʒss.; succi scoparii ʒj.; aquæ ad ℥j. Ter die sumend.

KINO.

Physiological.

Kino is astringent, in virtue of the tannin which it contains.

Therapeutical.

It may therefore be used in diarrhœa and other cases where astringents are indicated, but it seems to have no special advantage over other remedies of the same class.

BALSAMUM PERUVIANUM.

Local Action.

Physiological.

Peruvian balsam tends to check copious and unhealthy secretions.

Therapeutical.

It may therefore be used like myrrh, as an application to foul and unhealthy sores.

Constitutional Action.

Like the other gum balsams, it acts on the mucous membranes, and more especially on the bronchial tubes.

It has therefore been prescribed to restrain excessive discharges in bronchitis, &c.

BALSAM OF TOLU.

This agreeable preparation is almost exclusively used as a flavouring addition to cough mixtures, in the form of the syrup.

HÆMATOXYLI LIGNUM (LOGWOOD).

Physiological.

Logwood has astringent properties.

Therapeutical.

It is an agreeable and efficient remedy in diarrhœa, and is well taken by children. We must remember that it imparts its pink colour to the fæces, and to the urine, should that secretion chance to be alkaline.

℞ Extracti hæmatoxyli gr. x.; tincturæ catechu ʒss.; syrupi ʒj.; aquæ carui ad ℥j. Ter die.

℞ Pulveris cretæ aromatici ʒj.; tincturæ opii ʒj.; syrupi zingiberis ℥j.; decocti hæmatoxyli ad ℥vj. Misce, fiat mistura, cujus sumat unciam unam post singulas dejectiones liquidas.

PHYSOSTIGMATIS FABA (CALABAR BEAN).

The ordeal bean of Old Calabar.

Local Action.

Physiological.

When applied to the surface of the body, Calabar bean exerts no special influence, but when introduced to the eye it causes very complete contraction of the pupil, the effect beginning in fifteen minutes, and lasting for about eight hours. This is attended by a little twitching of the lids, slight supra-orbital pain, dimness of vision, fall of intra-ocular tension, spasm of accommodation, and myopia. The pupil contraction is held to be due to stimulation of the fibres of the third nerve supplying the iris.

Therapeutical.

Calabar bean is therefore of use in ophthalmic surgery, to counteract the dilating effect of belladonna, and to prevent prolapse of the iris in cases of corneal injury or ulceration.

The most convenient way of using Calabar bean in ophthalmic surgery is by making a solution of sulphate of eserine gr. ij. to water ʒj., and putting a drop into the eye. This application is of service in strumous and phlyctenular ophthalmia and corneal ulceration, by limiting the access of light to the retina, and diminishing the reflex action, causing spasmodic contraction of the lids.

Constitutional Action.

I. *On Nervous System.*—

1. The brain is quite unaffected, the mind remaining clear almost to the last, in cases of poisoning.

2. The spinal cord, however,

2. The depressing action

is specially attacked, and to a diminution of its motor power are due the muscular enfeeblement and final paralysis which affect those brought fully under the influence of this drug. A still more remarkable result, however, is the total abolition of all reflex activity, the most energetic stimulation failing to elicit the slightest response.

of Calabar bean on the reflex powers of the spinal cord led Fraser to propose it as a remedy for tetanus; and this mode of treatment has proved very satisfactory in alleviating the symptoms and checking the course of this terrible disease. It is of great importance that the drug should be early used and vigorously pushed, as there is every reason to believe that the cord is free from marked pathological changes during the first period of the disease.

Calabar bean has been tried without success in epilepsy and other nervous disorders; but Bouchut tells us that eserine has proved an excellent remedy in chorea, the dose by subcutaneous injection being from gr. $\frac{1}{35}$ to $\frac{1}{14}$; and recently Dr. Crichton Browne has expressed his conviction, founded on the observation of a few cases, that it may prove useful in the general paralysis of the insane; and it has been employed, with alleged success, in locomotor ataxy and writers' cramp.

It has also been found to act as an effective antidote in strychnia poisoning.

3. Although, in the first stage of Calabar-bean action, the motor nerves are unaffected, a secondary lessening of their conductivity is noted, and, with reference to the sympathetic system, an early excitation is followed by a secondary depression.

A few drops of a solution of gr. 2 of sulphate of eserine dropped into the eye every 15 minutes has proved beneficial in acute glaucoma.

The contraction of the iris noted above, which takes place equally on local or internal administration, is considered due to paralysis of the peripheral vaso-motor nerve fibres and to stimulation of the terminal filaments of the third nerve.

II. *Circulating Apparatus.*—Under small doses of Calabar bean, the heart's action becomes slower and stronger, and the arterial tension is notably increased; but when the system is brought more fully under the poisonous influence of the drug, the cardiac pulsations become feeble and irregular, and finally cease. These results are believed to be due

to stimulation and subsequent exhaustion of the peripheral cardiac filaments of the vagi, and the primary contraction and subsequent relaxation of the arteries are explained in the same way.

III. *Respiration and Temperature.*—The breathing usually becomes slow and irregular, and the temperature falls a little.

IV. *Secreting Organs.*—Calabar bean tends to cause vomiting, with violent and painful contraction of the stomach and increased peristaltic movement of the intestines.

Increase in the salivary and cutaneous secretions has also been observed.

Poisonous Action.—Calabar bean in small doses destroys life by paralysing the respiratory centre and causing suffocation, but in larger quantity it proves more speedily fatal by cardiac syncope.

IV. Calabar bean is an hepatic stimulant, but only in poisonous doses, so that this side of its action has no practical application. Atropia antagonises this, as all the other actions of the drug.

Antidotes. — In addition to the general principles of treating this form of poisonous action, we have here physiological remedies at command —(1) atropia, which directly antagonises the respiratory depression; and possibly (2) strychnia, which stimulates the cord.

Cautions. Mode of Administration.

Caution is of course necessary in dealing with so poisonous a substance as this. It is seldom used internally, for in tetanus the functions of the stomach are suspended in great measure, and drugs are probably only very partially observed. Subcutaneous injection is therefore our best method, and we use a solution of the extract (from $\frac{1}{6}$ to $\frac{1}{3}$ gr.), neutralising its irritating acidity by the addition of a little soda.

The alkaloid physostigmine or eserine is a convenient preparation, and may be used hypodermically.

Lamellæ or discs made with gelatine and glycerine, and each containing $\frac{1}{1000}$ gr., have been introduced into the B. P.

SENNA.

Physiological.

Senna irritates the small intestine, causing copious thin yellow evacuations, and stimulating the peristaltic movements of the bowel.

'It is an hepatic stimulant of very feeble power, rendering the bile more watery.'—Rutherford.

Therapeutical.

Senna is a most useful purgative, ranking among the cathartics, and it may be prescribed in simple constipation, in dyspepsia, and in a large variety of conditions where rapid and effectual unloading of the bowels is required.

Dose and Mode of Administration.

Senna is seldom prescribed alone, as it is then apt to cause irregular contraction of the intestines and griping. It is therefore usually combined either with other purgatives, as mag. sulph., or with various aromatics, as in the confection and compound mixture.

Cassia and tamarinds have both a slightly purgative action, but are only used as ingredients in various compound preparations, as the confection of senna.

ACACIÆ GUMMI.

Gum is demulcent, and in the form of mucilage is much used for the suspension of bulky and insoluble powders, as well as to prevent the precipitation of the resin which ensues when such substances as tincture of myrrh, tinct. cannabis indicæ, &c., are added to water.

COPAIBA.

Local Action.

Physiological.

Copaiba locally applied seems to act as a slight stimulant to the skin.

Therapeutical.

It has been used in this way in certain obstinate affections of the skin, such as psoriasis; and in India it seems to have been employed with some success in leprosy and lupus, bearing as it does a considerable analogy to the gurgon oil which has lately acquired so high a reputation in the treatment of the first-mentioned disease. Its nauseous smell, however, must always be a serious barrier to its use.

Constitutional Action.

I. *Brain and Nervous System.*—No influence is exerted by copaiba on the brain, spinal cord, or nerves.

II. *Heart and Circulation.*—No effect is produced on these organs, or on the respiration or temperature.

III. *Digestive and Secreting Organs.*—1. *Stomach and Intestines.* — Copaiba frequently causes most violent vomiting and purging.

2. It has a stimulating effect on mucous membranes generally, but more especially on those of the genito-urinary tract, in virtue of which, after slight preliminary irritation, it checks and finally arrests excessive discharges.

3. *Kidneys.* — Copaiba, and more particularly the resin, increases very considerably the water of the urine without specially affecting the solid constituents.

4. Copaiba, by internal administration, seems to stimulate the skin, and occasionally produces an eruption of bright red papules, not unlike measles, usually beginning on the hands, spreading over the body, and causing much tingling and itching.

Copaiba is an excellent remedy (1) in gonorrhœa, where it may be given with great effect as long as the discharge continues thick and puriform. When the earliest inflammatory symptoms have been subdued by alkalies and diluents, it will prove our best remedy; and it seems to act neither purely locally nor constitutionally, but in both ways conjointly, being altered in some way in the blood, and then exerting a topical influence on the affected mucous tract. (2) It is also of service in chronic cystitis, and in the later stages of bronchitis, when profuse and exhausting discharges have been established from the bronchial tubes. (3) As a diuretic the resin has been most highly praised by Dr. Wilks and Dr. F. Taylor in the dropsy of heart disease,

in ascites, and in some forms of renal affections. (4) Dr. Liveing, more especially, has drawn attention to the value of copaiba in psoriasis and other obstinate skin diseases.

Absorption and Mode of Elimination.

Copaiba is very rapidly absorbed into the blood, as indicated by the communication of its nauseous smell to the breath and urine, by which channels it is principally eliminated. On the addition of nitric acid to the urine of patients taking copaiba, a milky appearance is produced by precipitation of the resin, and this is distinguished from albumen by the action of heat, which melts the resin and removes the deceptive cloud.

Peculiarities. Mode of Administration.

The digestive disturbance occasionally caused by copaiba prevents some persons from taking it at all, and the almost invincibly nauseous nature of its flavour and odour is a serious drawback to its use. Capsules both of sugar and gelatine have been devised, which are frequently well borne; but we must remember not only that these are often too large to be swallowed with comfort by nervous persons, but that their use is apt to be followed by disagreeable eructation. No means have been proposed to obviate the measly and irritable rash which not unfrequently appears on the skin of patients under the influence of copaiba; but various forms of prescriptions are in general use, and some of these are moderately effectual in concealing the offensive flavour of this useful drug.

℞ Copaibæ, liquoris potassæ, āā fl. ʒss. Misce agitando et adde mucilaginis acaciæ fl. ʒij.; spiritûs ætheris nitrosi ʒss.; tincturæ opii ♏v.; aquæ ad ℥j. Fiat haustus ter die sumendus. For gonorrhœa.

℞ Copaibæ, syrupi tolutani, pulveris acaciæ, āā ℥ss.; acidi sulphurici aromatici ʒss.; aquæ destillatæ ℥vj. ℥ss. ter die. For gonorrhœa.

℞ Resinæ copaibæ ʒiij.; alcohol ʒv.; chloroformi ʒj.; mucilaginis acaciæ ℥ij.; aquæ ad ℥xij. Misce. Capiat semunciam ter in die. Formula of copaiba as a diuretic.

Oleum santali has some reputation in cases of gonorrhœa. Dose, 10 to 30 minims.

ROSES.

The various preparations of roses have little therapeutical significance. The cabbage rose is used in the form of rose-water as an elegant vehicle; the red rose petals as confection constitute a convenient basis for a pill mass, whilst, combined with sulphuric acid in the acid infusion, they make an excellent gargle, either alone or with alum, whilst they may occasionally be of service in concealing the nauseous flavour of sulphate of magnesia.

Hips are also slightly astringent.

AMYGDALA AMARA, DULCIS, OLEUM.

The bitter almond, being uncertain and dangerous, is never used in medicine; but sweet almonds, in the form of the mixture or powder, are of value as agreeable vehicles for the mixture or suspension of other drugs; and Dr. Pavy has taken advantage of their nutritive properties to propose them as a substitute for bread in saccharine diabetes.

PRUNES

are slightly purgative.

CUSSO (KOUSSO).

Physiological.

The action of kousso is poisonous to the tape-worm, without exerting any irritating effect.

Therapeutical.

It is therefore occasionally used as an anthelmintic, and with good effect when given on an empty stomach, according to the rules generally laid down.

Mode of Administration, &c.

It is well not to use the official tincture, but to get the fresh flowers, boiling about half an ounce in 3 or 4 oz. of water, adding a little lemon peel, and directing the patient to swallow the whole draught, dregs and all. A little vomiting sometimes follows, but is seldom troublesome.

CLOVES, PIMENTO, AND OIL OF CAJUPUT

are carminative and perhaps antispasmodic, and may be useful in flatulent colic, hysteria, &c., more especially as adjuncts to other remedies. Oil of cloves is a popular and very effective remedy for toothache.

GRANATI RADICIS CORTEX.

Physiological.

Pomegranate bark destroys a tape-worm, according to Küchenmeister, in three hours.

Therapeutical.

It is much used as an anthelmintic in veterinary practice.

COLOCYNTHIDIS PULPA.

Physiological.

Colocynth produces a good deal of irritation of the large

Therapeutical.

Colocynth is a drastic purgative, rapid and efficient

intestine, causing profuse watery evacuations; and, if given in excessive dose, even proving fatal by inflammation and ulceration. It is found, however, that its drastic action, as well as the griping to which it occasionally gives rise, may be obviated by combination with aromatics and other purgatives.

in its action, and much used as an ordinary remedy in habitual constipation and various dyspeptic conditions. In large doses it is a powerful hepatic as well as intestinal stimulant. It renders the bile more watery, but increases the secretion of biliary matter.

Mode of Administration, &c.

Colocynth is rarely, if ever, prescribed alone. The compound extract pill, containing, in addition, aloes and scammony, is a useful formula; but the best mode of combination is undoubtedly that with either hyoscyamus or belladonna, the dose being from 5 to 10 grains.

ELATERIUM.

Physiological.

Elaterium produces irritation of the intestine, ending in inflammation where incautiously pushed, and causes the evacuation of large quantities of watery fluid. It purges equally powerfully when injected below the skin or taken by the mouth, but it is stated that solution in the bile is necessary to develop its full action. In some of the lower animals peculiar nervous symptoms follow its use, and

Therapeutical.

Elaterium is the most powerful hydragogue cathartic with which we are acquainted, and as such has been used to withdraw watery fluids from the intestines in various forms of cardiac disease, lightening the labours of the heart by lessening the volume of the blood, and relieving the cellular tissue and various cavities of dropsical accumulations. As, however, it is uncertain and very de-

vomiting and great depression are liable to be produced in the human subject even by moderate doses. Elaterinum is the active principle of elaterium. Dose, $\frac{1}{14}$ to $\frac{1}{10}$ gr. pulv. elaterini compositus.

pressing in its action, it is now very rarely used, in comparison with compound jalap powder, which seems to fulfil the same useful indications without an equal chance of seriously weakening the patient. Dose, from $\frac{1}{16}$ gr. to $\frac{1}{2}$ gr.; or, of the compound powder, $\frac{1}{2}$ gr. to 5 gr.

ASSAFŒTIDA.

Physiological Action.

A good deal of digestive disturbance seems to follow the administration of this drug to healthy persons; but the evidence is too conflicting to enable us to lay down any exact scheme of its influence on the various functions of the body.

Therapeutical.

Assafœtida has been used and recommended in a considerable variety of affections, but practically it is now only prescribed in flatulent dyspepsia and in hysteria, where its excessively nauseous smell and taste are supposed to give it an advantage over other drugs of the same class. The most commonly used preparation is the spiritus ammoniæ fœtidus. Dose, $\frac{1}{2}$ fl. drm. to 1 fl. drm. The enema is useful in flatulence.

CONIUM.

Local Action.

Conium has been occasionally used in the form of poultice as an application to cancerous sores or tumours, and it is said that the severe lancinating pain common to these affections may thus be mitigated.

Internal Actions.

Physiological.	*Therapeutical.*
I. *On Nervous System.* 1. *Brain.*—No effect is produced on the brain proper, it having been observed in cases of poisoning, and notably in that of Socrates, and in a patient under Prof. Bennett's care, that the intellectual faculties are quite unimpaired to the last.	
Dr. John Harley, however, is of opinion that a considerable portion of the action of conium is expended on the motor ganglia, and more especially the corpus striatum.	I. To this action Dr. Harley ascribes the beneficial influence of conium in chorea. Although in many cases we may derive real advantage from this remedy, it often fails, and in order to insure the full amount of benefit, we must use large doses, and see that the drug is pure. Dr. Harley also recommends it in the nervous twitchings met with in some cases of hemiplegia. Conium has been given with some benefit in the convulsions of children.
2. *Spinal Cord.* — Pure conium has no special influence on the spinal nervous system, but an alkaloid, methyl conine, which it usually contains, has been proved to cause first exaltation, and finally depression, of the reflex function of the cord.	
3. *On the Nerves.*—Herein lies the true physiological action of conium. It acts first on the third nerve, causing drooping of the eyelid, dilatation of the pupil, and sluggish	3. Dr. Harley recommends its use in the violent spasm of the orbicularis met with in keratitis, but I have been unable to confirm this after careful trial.

and impaired movement of the eyeball. The influence then spreads to all the other motor or afferent nerves. A sensation of weight and enfeeblement of the legs, followed by staggering, is first experienced, and finally total paralysis is developed, the victim being entirely unable to move; and so complete may this become that asses in Italy which have fed on hemlock have been flayed alive without the possibility of resisting in any way. This paralysing influence is at first confined to the terminal extremities of the nerves. Conium usually contains some methyl conine, which considerably modifies the action of the pure alkaloid. This substance does not, like conine, expend its action on the end organs of the motor nerves, but extends to the cord, first exalting and finally abolishing its reflex function.

The sensory nerves are quite unaffected.

II. *Vascular System.*—No effect is produced on the heart or circulation.

III. *Respiration and Temperature.*—The breathing is

The remarkable power of conium in effecting muscular relaxation would indicate its use in a variety of spasmodic conditions. Thus, in laryngismus stridulus, trismus, spasmodic wry-neck, spasmodic stricture, and perhaps in the reduction of hernia and dislocation where any contra-indication to the use of anæsthetics exists, it seems worthy of trial, and Dr. Handfield Jones recommends it highly in paralysis agitans. It must, however, be confessed that the therapeutical success of conium by no means comes up to its physiological promise.

Dr. Crichton Browne has seen good results from the use of conium in mania with violent motor excitement, in which it restrains the violent muscular movements; and Dr. R. Burman has successfully used conine by hypodermic injection in the same class of cases.

at first unaffected, but, as the poisonous action of the drug goes on, the paralysis spreads to the respiratory centre, and death ensues from asphyxia.

Some lowering of the temperature has been observed.

IV. *Secretion.* — No influence on secretion has been noted.

Mode of Elimination.

The presence of conium has been detected in the blood, and its elimination is effected by the breath and urine.

Mode of Administration, Cautions, &c.

It having been satisfactorily proved that the succus is the only reliable preparation of hemlock, it is not necessary for us to say anything about the tincture, extract, vapour, or compound pill. Unfortunately, however, it is often difficult to obtain an efficient succus, as it keeps ill, and cannot always be satisfactorily made, the cultivated plant, which is sometimes used, being quite inert. Disappointment frequently occurs both from this cause and from the smallness of the dose often given in accordance with the recommendation of the Pharmacopœia. In order to obtain any decisive effect, we must give from half an ounce to 3 or even 4 ounces, as has been done by Dr. Harley, remembering that the limit of safety is reached when any interference with involuntary movement is observed, this being best indicated by enfeeblement of deglutition.

Children bear conium remarkably well. I have given ounce doses to a girl of eight, and the late Dr. Anstie gave a girl of seven, suffering from chorea, ℥viij. in twenty-four hours, without the slightest development of physiological symptoms.

The alkaloid conine has occasionally been used by subcutaneous injection; but when used pure in this way, it is not only physiologically inert, but is very irritating, and the addition of acetic or hydrochloric acid is necessary to ensure physiological action. When taken by the mouth it is rapidly and certainly poisonous, from 10 to 15 minims having proved fatal.

℞ Coninæ ʒiij., ♏xij.; acidi acetici fort. ♏ijss.; spt. vin. rect. ʒj.; aquæ destillat. ad ℥iij. ♏vijss. contains ♏j. of conine, the dose being $\frac{1}{10}$ ♏.

COCA.

The dried leaves of the coca plant, when chewed, are valued by some authorities as a nervine and muscular stimulant. The dose of the extractum cocæ liquidum is from $\frac{1}{2}$ to 2 drachms.

Cocainæ hydrochloras, the hydrochlorate of the alkaloid, has recently attained a high and well-deserved reputation as a local anæsthetic. When applied to the tongue it abolishes taste and tactile sensibility, and when a four per cent. solution is dropped into the eye it enables cataract operations, and those affecting the cornea alone, to be done painlessly, and materially reduces if it does not remove the pain of operation on the iris and the muscles of the eye as well as on the lacrymal apparatus (*vide* Power's address on Ophthalmology at the Brit. Med. Assoc. meeting, 1885).

'It appears to act essentially as a stimulant to the sympathetic system of nerves, in consequence of which it effects dilatation of the pupil, constriction of the blood-vessels, diminution of the intra-ocular tension, enlargement of the palpebral fissure, and protrusion of the eyeball.' Its use also greatly facilitates laryngoscopic examinations and operations about the throat, as well as the uterus and bladder, and in supra-orbital neuralgia it speedily relieves pain when dissolved in oil of cloves and rubbed gently over the affected spot. Preparation lamellæ cocaniæ, each containing $\frac{1}{200}$ gr.; dose $\frac{1}{5}$ gr. to gr. j.

GALBANUM AND AMMONIACUM

are substances of no special therapeutical value.

ANISE, FENNEL, CORIANDER, CARAWAY, AND DILL

are agreeable aromatics, stomachics, and carminatives.

SUMBUL

has antispasmodic properties, but is very rarely prescribed.

ELDER FLOWERS

are only used in the form of the aqua sambuci, which is a cooling and pleasant lotion.

CINCHONÆ CORTEX.

Effects and Uses.

In any comparative estimate of the absolute importance of various drugs to the human species, cinchona would probably take the second place, the first being, by universal consent, accorded to opium. The bark itself, however, is not now of so much importance as in former years, when it was our sole dependable remedy for the poison of ague, and was then given in such enormous quantities as to be very embarrassing to the weak stomachs of feverish patients. This difficulty is now happily removed, and much greater precision and efficiency given to our treatment, by the introduction of quinine, the discovery of which in 1820 inaugurated a true era in therapeutics.

The preparations of cinchona are now used almost exclusively on account of their tonic properties, and in many cases

of general debility, want of appetite, and loss of tone most gratifying results are obtained by their employment either singly or in combination. Quinine itself, however, has a higher and wider therapeutic range, and has in recent years obtained so much of the careful attention of physiologists that we are bound to consider its properties with as much care and precision as the present state of science allows.

Local Action.

Quinine is occasionally, although rarely, used as a local application; but the theory of this is so intimately bound up with its internal use that we need not refer specially to it at present, save to note that an injection of gr. ij. ad ℥j. has been found of great service in checking the unhealthy secretion of an irritable bladder.

Internal Action.

Physiological.

I. *Nervous System.* — 1. *Brain.* — Quinine in large doses causes curious brain symptoms, such as partial blindness, well marked deafness and ringing in the ears, giddiness, and frontal headache, associated with a peculiarly dull, heavy expression of countenance. Binz has suggested that some at least of these phenomena may be due to partial anæmia of the brain, caused by enfeebled action of the heart. Hammond, on the contrary, asserts that quinine causes congestion of the brain.

Therapeutical.

I. The subcutaneous injection of quinine has been highly recommended by Surgeon-Major Hall in sunstroke.

This mode of administering the drug, however, is not unfrequently followed by inflammation and even abscess at the seat of puncture. Gubler prefers the bromhydrate to the sulphate, as being less irritating and better adapted for use in this way.

The oxytocic action of quinine must be, in part at least, due to its action on the nervous system; but its un-

Gubler asserts that it stimulates the great sympathetic and auditory nerves.

It contracts the uterus.

2. *Spinal System.* — In frogs quinine acts powerfully in reducing the reflex irritability of the cord, the animal lying motionless, quite insensible to external impressions, the stillness being only broken by occasional tetanic spasms; but this action is contradicted by the more recent experiments of Binz.

II. *On Vascular System.*— Moderate doses of quinine increase the frequency of the pulse; but if larger quantities be given, the rate of pulsation falls, the arterial tension diminishes, and death may even ensue from convulsions or sudden collapse following depression of the heart's action.

Quinine has a direct action on the white corpuscles of the blood, checking their amœboid movements, and arresting their tendency to migrate through the walls of the capillaries under inflammatory conditions.

doubted power in contracting the uterus has not yet been much used in medicine. It appears to be appreciated in the United States. There it is frequently used as a parturifacient in single doses of gr. x.–xv. It has, however, been asserted that it may be injurious to the fœtus.

II. Quinine has therefore some stimulating properties. It has been shown to be a valuable remedy in 8 to 15 grain doses, in combination with potassic iodide, in cases of specific and non-specific serpiginous and phagedenic ulceration, after the failure of other remedies.

Very large doses seem to be well borne in pyrexial conditions.

An essential part of inflammation and suppuration is now known to be extrusion of the white blood corpuscles from the capillaries, and their subsequent transformation into pus-cells. Quinine may therefore be of great service

It also prevents, in some degree, the due giving up of oxygen by the red corpuscles, and may thus interfere with the oxygenation of the tissues.

III. *Respiration and Temperature.* — No influence on the respiratory function has been observed. On the temperature of a person in full health but little lowering effect is produced; when fever is present, however, the temperature may be brought down by giving large doses. Opinions differ so much as to the explanation of this effect that it is impossible to speak with any confidence on the question.

in localised inflammations, and in checking exhausting discharges from abscesses or wounds; and in pyæmia good results have followed its use.

III. The antipyretic properties of quinine are much prized in Germany, and it is there largely used in the treatment of *typhus*, *typhoid*, *acute rheumatism*, and *pneumonia*.

Immense doses, even reaching 75 grains, have been given, and it is observed that tolerance of the drug is undoubtedly present in fever, and that very much larger quantities can be taken than in a state of health. It is only when very freely given, however, that it has any cooling influence; and we are advised to prescribe from 25 to 45 grains in divided doses within the first half-hour, and then allow an intermission of from 24 to 48 hours, as the effect would be diminished by spreading it over a longer time, on account of its rapid elimination. On account of this rapid elimination, Liebermeister considered it even a more valuable antipyretic than the cold bath.

In this country we do not

make very extensive use of quinine in febrile disorders, for the resulting diminution of temperature is only temporary, and has no influence on the progress of the disease. When a really dangerous degree of pyrexia is reached, we know that we can hold it readily in check by cold baths.

A committee of the Clinical Society reported (vol. iii.) on the antipyretic action of quinine, finding that large doses reduce temperature in pyrexia when given towards the end of the exacerbation or during the remission. It seems, however, to have no influence in shortening the duration of a specific disease.

They advise a single large dose, followed by an intermission of from 24 to 48 hours. Ringing in the ears was occasionally observed, but other physiological results were extremely rare. Dr. Clifford Allbutt finds quinine of use in septic fevers, such as pyæmia, septic absorption, erysipelas, peritonitis, &c., reducing the oscillations of temperature, but not relieving the general conditions. Dose from 20 to 60 gr. daily. He holds it to

IV. *On Secretion.* — In moderate doses, quinine increases the secretion of saliva, and augments, like most bitters, the flow of gastric juice, stimulating the appetite at the same time.

If larger quantities, however, are taken, an exactly opposite effect is produced; hunger is blunted, and the alkaloid, acting as an irritant to the mucous membrane of the stomach, checks the gastric juice. The urine is found to be unaltered in quantity, but the amount of uric acid and probably of urea given off is decidedly diminished.

V. Quinine is an excellent antiseptic, preventing and arresting decomposition. This it does in virtue of its poisonous influence over minute organisms, for we know that the process of decay is caused by the formation and rapid multiplication, within the putrefying fluid, of microscopic bodies called microzymes. Quinine in small doses paralyses,

be not only useless, but possibly injurious in typhoid. It has been used with success to check the night sweats of phthisis.

IV. Quinine is the best tonic we possess, increasing the appetite and bracing up the intestinal mucous membrane. It is given, therefore, in all states of the system where debility is present, in simple loss of appetite, in some forms of *dyspepsia*, in *neuralgia*, especially of the supra-orbital nerve, in convalescence from acute disease, to arrest the *nocturnal sweating* of phthisis, &c.

V. In virtue of this poisonous influence over protoplasm and minute germs, it has been recommended in large doses in *whooping-cough* on the ground of destroying the vitality of the thick and tenacious mucus which causes so much irritation in the bronchial tubes, or, as others hold, by destroying the minute fungus on which the disease

and in larger destroys, these creatures, and so at once arrests further destructive action.

Some authorities have been inclined to explain its remarkable influence over ague by theoretically supposing that the essence of the malarial poison really consists in a minute germ or vegetable cell, derived from the marshy land where the pestilence breeds, and that the antiseptic property of the drug is here the true explanation of its therapeutic success.

This seems to be borne out by the recent observations of Lanzi and Zerner, who have found an identical fungus in the decaying vegetation of the Roman Campagna, and in the tissues of the victims to malaria.

depends. [Henke.] During the later stages of the disease I have seen much benefit from this treatment. Again, in *hay-fever*, which is now proved to result from the local action on the Schneiderian mucous membrane of the pollen of particular grasses, Prof. Helmholtz has lately pointed out that quinine, applied in the form of snuff or strong solution (gr. j.–f℥j.), will effect a speedy cure.

Specific Action.

Quinine has what, for want of a better explanation, we must call a specific control over all malarial fevers and diseases which display any periodical tendency. Gubler, however, denies all specific influence, and believes that it acts by giving tone to the sympathetic nerve, thus enabling it to resist the attack of the malarial poison. Binz, on the contrary, denies all neurotic explanations, and holds its effects to be due to its paralysing action on the septic processes caused in the

blood and tissues by a ferment from decaying vegetation, whose further chemical development is thus arrested.

Quinine may act as a prophylactic, and, given in moderate doses at regular intervals, may ward off attacks; and this fact is extensively taken advantage of by African travellers and troops stationed in malarial districts, to whom rations of quinine are invariably served out. When the disease, however, is fairly developed, quinine will keep it in check and even arrest its progress; and this either in smaller doses frequently repeated, or in one considerable dose taken shortly before the attack is expected.

The periodical return of the paroxysms of shivering, heat, and sweating enables us to calculate with accuracy the very hour of the day at which to expect their recurrence; and experience has determined that the best mode of treatment is to give one full dose of 10 or 20 grains half an hour before the attack comes on.

The remarkable enlargement of the spleen which attends intermittent fever is often so rapidly diminished by quinine as to make it probable that the reduction of bulk is due to an active contraction of the substance of the organ itself.

Another curious point about the action of quinine is that, whilst it may check the rigors and rise of temperature attending the aguish paroxysm, the quantity of urinary water and urea excreted may be as much increased as they always are during the attack.

Quinine is also an invaluable agent in some of those affections which, without belonging directly to the aguish category, have something of the intermittent quality impressed on them; for example, we often find that neuralgia and various forms of headache are distinctly periodic, and return at regular intervals. In such cases quinine works wonders, and may effect a cure with almost magical rapidity.

Mode of Elimination.

Quinine, being possessed of considerable diffusive power, rapidly enters the blood, and is rapidly given out. It may be found in the urine in thirty minutes after ingestion; elimination is at its height in two or three hours, diminishes in twenty-four hours, and ceases in three days. Although traces of its presence have been found in the saliva, sweat, and intestinal secretion, it is by the urine that the greater part, probably about two-thirds, is given off, and according to some authorities the sulphate is converted into a different allotropic form, partly amorphous, and quite inert, which has been called quinicine.

Disadvantages of its Use.

In addition to the headache, deafness, ringing in the ears, and other physiological phenomena, already noted, a good many cases have now been recorded of eruptions on the skin. In some of the quinine manufactories abroad, eczematous eruptions are observed in the workmen employed, and its internal administration has been occasionally followed by a bright-red scarlatinoid rash, accompanied by intolerable itching and smarting, and followed by copious desquamation; or, more rarely, by a rubeoloid eruption, rather suggestive of urticaria, and attended with marked gastric derangement, a curious point being that these unpleasant effects have usually followed very small doses, sometimes of only a simple grain. Urinary irritation is also occasionally produced, more especially in the old, and consisting of dysuria, renal congestion, and even hæmorrhage. And we must remember that idiosnycrasy here plays an important *rôle*, and that some persons cannot take a single grain without inconvenience.

Therefore, as before advised, it is always well, before prescribing quinine, to ask our patient if he has ever taken it before. If much prostration follows a large dose, strong black coffee with brandy is the best antidote.

Mode of Administration and Dose.

This salt is best prescribed in mixtures with a little nitric or dilute sulphuric acid, as tinctures do not dissolve it well; though, as Ringer says, it is really unnecessary to combine acid, as the quinine is readily soluble in the acid of the gastric juice. But a little acid makes a more elegant mixture, by removing that turbidity which a certain quantity of the undissolved alkaloid necessarily imparts to a solution. The dose varies from about gr. j., which is the usual tonic dose, to 10, 20, 30 grains, or even more; and although in this country a larger quantity than 10 grains is perhaps rarely prescribed, it is clearly absurd to put the maximum dose, as in the British Pharmacopœia, so low as this.

A good way of obviating the headache and ringing in the ears is by adding to each dose ɱxxx. of hydrobromic acid, which is also a good solvent.

To avoid the bitter taste of quinine is absolutely necessary in some cases. For this purpose it is sometimes ordered in sugar-coated pills, or enclosed in *cachets de pain*. The powder may be given to children in a spoonful of syrup of red orange, or mixed with honey or molasses; it may also be taken in coffee, or simply suspended in cold water, or the powder sprinkled over the cut surface of an orange. Milk is a good menstruum for quinine, in which form children take it freely. The quinine may be enveloped in tissue paper and twisted tightly into a ball; a little practice will enable an adult to deftly swallow such a bolus without tasting, and with but little inconvenience. The aromatic elixir of glycyrrhizine has been recommended as the best vehicle for the administration of the sulphate of quinine; but preparations containing liquorice, such as the official fluid extract of taraxacum, or the compound liquorice mixture, are quite satisfactory for this purpose. Tannin has the power of disguising the taste of quinine, and, according to Rolander, it does not detract from its therapeutic

properties. The following formulæ will be found useful for the administration of quinine in solution :—

For children—

℞ Quininæ sulphatis	gr. xxiv.
Acidi tannici	ʒ ij.
Syr. cinnamomi	f ℥iij.

S. Capiat cochleare parvum ter in die.

Or, as the disulphate—

℞ Quininæ sulphatis	gr. xxxiv.
Acidi sulphurici dil. . . .	f ʒj.
Tinct. cardamomi co. . . .	f ʒiij.
Syrupi	q. s. ad f ℥iij.

S. Dose, f ʒj.

Or, in a cough mixture—

℞ Quininæ sulphatis	gr. xxiv.
Acidi sulphurici dil. . . .	q. s. ad solvendum
Mist. glycyrrhizæ co. . . .	ad f ℥iij.

S. Dose, a teaspoonful.

In the declining stage of whooping-cough.

For adults any of the preceding prescriptions may be used, or we may give the following :—

℞ Quininæ sulphatis	gr. xlviij.
Acidi sulphurici dil. . . .	q. s.
Syr. limonis	f ℥ij.
Aquæ	q. s. ad f ℥vj.

each drachm containing one grain of quinine. A more pleasant preparation would probably be obtained by substituting Curaçoa cordial for the lemon syrup. As a tonic carminative the following proves very acceptable in weakened digestion :—

℞ Quininæ sulphatis	gr. xlviij.
Acidi sulphurici dil. . . .	q. s. ad solvendum
Tinct. gentianæ comp. . . .	f ℥iv.
Syr. zingiberis	q. s. ad f ℥vj.

S. Dose, a dessertspoonful before meals.

Wine of aloes may be appropriately added should constipation be present in the case.

℞ Quininæ sulphatis . . . . gr. viij.
Acidi nitrici diluti . . . . f ℥ss.
Tincturæ aurantii . . . . f ℥ss.
Syrupi aurantii cort. . . . f ℥j.
Aquæ . . . . . ad. f ℥viij.
S. Dose, f ℥j. ter die sumend.

For a case of debility and want of appetite.

℞ Quininæ sulphatis . . . . gr. j.
Ferri tartarati . . . . . gr. ij.
Morphinæ acetatis . . . . gr. $\frac{1}{12}$.
Ft. pil.

A useful combination in neuralgia.

Some persons who object to sweets prefer the syrup to be left out; but it will usually be found an agreeable addition. Quinine may also be given in the form of simple powder dissolved in a glass of sherry, and when a large dose such as 10 grains is prescribed, it is more conveniently taken in simple suspension in distilled water. A very common plan is to order quinine with acid infusion of roses, but Squire has pointed out that a turbid and unsightly mixture is thus produced from the resulting tannate of quinine being insoluble in sulphuric acid; whereas if the infusion be made with nitric acid the mixture is 'bright and attractive in appearance.'

Under the name of Warburg's tincture, a secret preparation of unusual complexity has recently been made public, and has been most highly recommended by Maclean in tropical diseases, and by Broadbent and Playfair in cases of shock and collapse. Under its use free perspiration sets in and the temperature goes down, and it is believed that the action of the drug is materially aided by the powerful aromatics with which it is combined and the state of concentration in which it is given. Each one-ounce bottle contains 9½ grains of quinine, and it is best given on an empty stomach after preliminary evacuation of the bowels, the ounce being taken undiluted and repeated in two or three hours.

Other Preparations.

In addition to quininæ sulphis, the other alkaloids and substances have been detected in bark, some of which are in use in medicine. Quininæ hydrochloras is now made official, and we have—

1. Quinic or kinic acid.
2. Quino-tannic acid.

Quinetum is the collected alkaloids of bark, and has been found to be very efficacious in chronic cases of ague.

3. Cinchona red.
4. Kinovin.

These four have no therapeutic significance.

5. Cinchonine has some febrifuge power, and sulphate of cinchonine now official, can in many cases take the place of quinine as an antiperiodic, at about one-eighth the cost.

6. Quinidine has been reported as nearly equal to quinine in the foregoing respect, and is an efficient substitute for the more expensive salt.

7. Cinchonidinæ sulphas is also official, and has some tonic properties.

None of these preparations have been able to completely take the place of quinine, as they are weaker, less certain in action, and less agreeable; and quinine, notwithstanding its comparatively high price, still retains its position as our most reliable antiperiodic.

The preparations of cinchona, as we said before, are principally used for their tonic properties; and there is perhaps no more pleasant and effectual medicine of this class than the ordinary tincture of bark, whilst the decoction or infusion is in very general use as a vehicle for more active drugs.

ANTIPYRETICS AND REFRIGERANTS.

Antipyretics.

Physiological.

Antipyretics are remedies which reduce the bodily temperature, some acting only against the preternatural heat of febrile conditions, whilst others can also cool down the natural warmth below the normal standard. We may thus divide their action :—

Class 1. Those which act by directly cooling the surface of the body by local application.

Class 2. Those which act by internal administration, either lessening oxidation or

Therapeutical.

In this country we are not much in the habit of regarding the temperature *per se* as a special element of danger unless it goes beyond a certain height, and we therefore do not, as a rule, treat this symptom very energetically. Foreign experience seems to show that, although we may reduce the actual heat in acute disease, we do not necessarily alter the course of the attack, and we therefore usually confine our efforts to supporting our patient and looking out for complications. On the other hand, however, when the thermometer registers 105°, and still tends upwards, we are bound to interfere.

1. This is, undoubtedly, our most effectual antipyretic means, and may be carried out by cold affusion, wet pack, or, best of all, by the carefully graduated cold bath.

2. This class consists of the antipyretic drugs properly so called, such as quinine,

exerting some special influence on the nervous system.

digitalis, veratrine, alcohol, salicylic acid, &c.; but, with the exception of the last named, they are not much used for this purpose. It is a remarkable fact that very few, if any, of these drugs have the power of reducing the normal temperature, save when given in large and almost poisonous doses (*vide* Alcohol and Quinine).

Class 3. Those which act by dilating the superficial vessels and enabling a larger sheet of blood to be spread over the cutaneous surface, and thus brought in contact with the cooling influence of the air. The chilling effect then produced by the return of the circulating fluid to the heated centres, although very transient, may become considerable by repetition.

3. Under this heading we must include the whole class of diaphoretics, as well as chloral hydrate, the warm and Turkish bath, &c.

Class 4. Remedies which act by bracing up and strengthening the nervous system, and removing some of that enfeebled and semi-paralysed condition on which febrile temperatures have been supposed to depend. Those who, like Liebermeister, adopt the antipyretic plan in its entirety, combine the various agents.

4. A rising temperature being often an indication of debility, we may then check it by tonics, good food, small doses of alcohol, &c.

Whilst using very frequent baths, as often as every two hours—in severe cases two hundred, even, having been given during one illness—he orders quinine in large doses, holding it first among cooling agents; digitalis where the heart is strong, thus reversing our usual therapeutical rules; and veratrine, which seems to act by causing a kind of collapse. Statistics, however, do not show any superiority of this over the more expectant plan practised in England. Prof. Gairdner ('Glasgow Med. Journal,' September 1878) well calls the German plan a battledore and shuttlecock treatment, consisting, as it does, 'in keeping the patient, partly by means of cold baths, and partly by these other remedies, in a state of constant oscillation between fever and incipient collapse.'

Refrigerants.

Refrigerants, of course, necessarily include all remedies which actually lower the bodily temperature, but the conventionally accepted meaning of the term simply implies anything which alleviates thirst. Thus we find that the mere sipping of any fluid moistens the dry tongue and lessens the thirst of fever, whilst acids, by stimulating the secretion of saliva, may fulfil the same indication in a more scientific and effectual way.

JABORANDI.

Constitutional Action.

Physiological.

Within ten or twelve minutes after jaborandi has been taken, the face flushes deeply, and profuse perspiration follows, accompanied by a great increase of salivary secretion and much nausea and depression, terminating in from two to four hours. The loss of fluid thus produced is very considerable, and the sweat has been proved to contain a large excess of urea. This action on the skin is considered due to vasomotor paralysis and consequent dilatation of the cutaneous arterioles, and the sialogogue effects of the drug are attributed to stimulation of the periphery of the nerves supplied to the salivary glands. Jaborandi increases somewhat the action of the heart; and contraction of the pupil, with impaired accommodative power, has been noted to attend its use.

Muscarine and atropine are in many respects its exact physiological antidotes.

Therapeutical.

The powerful diaphoretic action of jaborandi, no less than its power in aiding the elimination of urea, would seem to suggest its use in various chronic *kidney diseases*, as well as febrile conditions. But its action is too short, sharp, and sudden, and too much depression and inconvenience are produced, to render us very hopeful of its ultimate success in practice.

It has been prescribed in *diabetes insipidus*, and for the purpose of augmenting the secretion of milk.

If we wish to use the drug we should employ pilocarpine, its active principle, by subcutaneous injection, in dose of gr. $\frac{1}{12}$ to gr. $\frac{1}{3}$ of the nitrate, which is the best preparation. It is said to be a valuable remedy in diphtheria and some chronic skin diseases.

We can thus secure all the physiological action of the drug with a minimum amount of discomfort.

Preparations.—Infusion (dose), 1 to 2 oz.; tincture, ʒss. to ʒj.; extract, 2 gr. to 10 gr. Pilocarpinæ nitras, $\frac{1}{20}$ to $\frac{1}{2}$ gr.

IPECACUANHA.

Local Action.

Physiological.

The prolonged application of ipecacuanha to the skin causes some irritation, followed by the appearance of vesicles, pustules, and even troublesome ulceration. In some persons the powdered root causes violent irritation of the respiratory passages, ranging from symptoms resembling hay fever up to a spasmodic condition analogous to true asthma.

Therapeutical.

The use of the slowly acting and pustulating forms of counter-irritation has fallen out of fashion, as they are not only disfiguring, but give less relief than more sedative applications.

The only way in which we find ipecacuanha employed locally is in the form of spray, which Professor Ringer has found very useful in chronic bronchitis, winter cough, bronchial asthma with emphysema, and fibroid phthisis. In true spasmodic asthma its action is uncertain.

As the pure wine may cause nausea and irritation, he advises a dilution with from 1 to 2 parts of water, using the ordinary spray-producer, beginning with about 20 squeezes for the first sitting once a day, but afterwards more frequently repeated, the mouth being well rinsed out after each application. Cases of winter cough were generally cured in twelve days.

Constitutional Action.

I. *Brain and Nervous System.*—1. No effect seems to be produced on the brain.

2. Ipecacuanha has a markedly stimulating influence on that centre in the medulla oblongata which presides over the action of vomiting. It has been found by experiment to cause diminution of tactile sensibility and paralysis of the arms or forelegs, not unlike glosso-pharyngeal paralysis, and probably depending on exhaustion of the medulla by the vomiting act. Whether by subcutaneous injection or by being taken into the stomach, it causes, within a moderate period, a decided but mild emetic effect; and as this may arise either from irritation of the mucous membrane of the stomach or from a primary stimulation of the vomiting centre itself, ipecacuanha must be ranked among both the direct and the indirect emetics. Emetine given by subcutaneous injection is much slower in its action, and requires to be given in larger doses than by the mouth,

2. Ipecacuanha cannot be recommended in cases of poisoning, for not only does it act too slowly, but its nauseating and depressing influence may be injurious. It is of great service, however, in many of those affections of the throat or respiratory organs where we wish to empty the lungs, or detach foreign bodies or false membranes from the larynx or trachea, as in bronchitis, croup, diphtheria, &c.

A most remarkable fact in the action of this drug is its power, when given in small doses, of checking vomiting. Thus, in the vomiting of pregnancy, suckling, or menstruation, in the irritability of stomach of children, and in other dyspeptic conditions in which nausea and vomiting are leading symptoms, a drop of ipecacuanha wine taken every hour will often prove truly curative. At present this must be looked upon as one of the enigmas of therapeutics.

proving that it must primarily act on the gastric mucous membrane.

It may be said generally to occupy a middle place between sulphate of zinc and tartar emetic, being neither so prompt as the first nor so nauseating as the second.

II. *Circulation.* — Ipecacuanha has no direct influence on the heart or circulation, save the usual depression following nausea and vomiting. Emetine acts almost like ammonia in dissolving the red corpuscles of the blood.

III. *Respiration and Temperature.*—No effect is produced on the rapidity of the respiratory function, save the temporary acceleration usually accompanying the act of vomiting. There seems no doubt, however, that ipecacuanha causes an increased secretion from the mucous membrane of the bronchial tubes. After poisoning by ipecacuanha the lungs have generally been found in a bloodless condition in the early stages, intense congestion following its more prolonged action.

III. Ipecacuanha is therefore a most useful expectorant, thinning and diluting the pulmonary mucus, and thus facilitating its expulsion. It is hence almost universally employed in bronchitis, common catarrh, winter cough, &c. It was formerly used, and with some alleged success, in hæmoptysis, 5-grain doses repeated at short intervals exerting a marked depressing effect, and thus checking the tendency to bleeding ; but with the introduction of more effectual remedies this mode of treatment has now fallen into disuse.

IV. *Digestive and Secreting Organs.*—1. *Stomach and Intestines.*—As already noted, ipecacuanha causes irritation of the terminal filaments of the pneumogastric nerve distributed to the stomach, and thus sets in motion the reflex machinery necessary to produce vomiting. On the mucous lining of the intestinal canal, also, its effects are undoubted, as indicated by its action in disease; but we are at present unable to give any satisfactory explanation of its often marvellous influence over dysentery in its various forms.

IV.—1. Ipecacuanha in emetic dose is indicated in some overloaded conditions of the stomach, caused by excessive indulgence either in food or drink; and the dull aspect, coated tongue, foul breath, headache, and nausea may be promptly relieved in this way.

In acute dysentery ipecacuanha is now looked upon as a never-failing specific. It must here be taken in full doses, from 60 to 90 grains being given at once, this vigorous medication often cutting short the disease.

Let the patient remain very quiet on his back for at least 10 or 12 hours before repeating the dose, and we must then be guided by symptoms. Although the first dose may be rejected by the stomach, toleration is speedily established, and no more vomiting is produced. Some authorities recommend a previous administration of laudanum to quiet the stomach.

Under this treatment the pain and tenesmus rapidly subside, the motions regain natural colour and consistence, and the patient makes a satisfactory recovery.

In cases of dysenteric diarrhœa, so often met with in this country, and more especially in children, ipecacuanha in much smaller doses is also a very effectual remedy, the indications for its use being any appearance of blood or mucus in the stools, with pain and straining. In the more ordinary forms of diarrhœa, however, it is quite useless.

2. *Liver.* — Ipecacuanha is a powerful hepatic stimulant. It increases slightly the secretion of intestinal mucus, but has no other apparent stimulant effect on the intestines. The bile secreted under the influence of ipecacuanha has the normal composition (Rutherford).

2. It has therefore been given in the form of pill, and combined with other remedies, to relieve the sluggish digestion caused by a deficiency of bile.

3. *Skin.* — Ipecacuanha promotes slightly the cutaneous secretion, independent of the tendency to perspiration usually attending the action of emetics.

3. Ipecacuanha combined with opium, in the form of 'Dover's Powder,' is a well-known and tolerably effectual diaphoretic, much used in chronic rheumatism and feverish attacks.

Mode of Elimination, &c.

It is probable that as much of the ipecacuanha as remains after the action of vomiting is eliminated from the system by the biliary and intestinal secretions.

Mode of Administration.

The action of ipecacuanha wine is so notoriously uncertain that, when we wish to obtain the full emetic effect of the drug, it is best to have recourse to the freshly powdered root (15 to 30 grains), remembering, however, that children will bear unusually large doses.

In the treatment of dysentery, also, we shall derive most advantage from the use of the powder, and in ordinary cases of dysenteric diarrhœa we may give from $\frac{1}{2}$ to 2 or 3 grains in combination with compound tragacanth powder.

Vinum ipecacuanhæ, in doses of from ♏x. to ʒj., is an almost invariable ingredient of cough mixtures, but it keeps badly, and its effects are therefore uncertain. The U. S. Pharm. contains a very good fluid extract dose, 20 to 30 minims; and there is also a reliable syrup dose, $\frac{1}{2}$ dr. to 2 dr. We may give emetine, the active principle, as an emetic, in dose of from $\frac{1}{12}$ gr. to $\frac{1}{6}$ gr.

DIAPHORETICS.

Physiological.

This class of remedies has the property of increasing the secretions of the skin, and is usually divided into (1) the stimulating, and (2) the sedative. Under the first heading we include those drugs which stimulate the cutaneous circulation, among the principal of which are ammonia, alcohol, the cold bath, the cold pack, phosphorus, &c.; and, secondly, we speak of the sedative class, which act by

Therapeutical.

Diaphoretics are used freely in practice, at the outset of acute diseases, to relax the contracted vessels and relieve the hot dry skin; and in pneumonia this line of treatment has produced good results. The sedative class would seem to be best adapted for this purpose; but the cold bath, which more naturally belongs to No. 1, has been freely used abroad in febrile disorders, and part of its

dilating the superficial vessels, these being ipecacuanha, tartar emetic, jaborandi, aconite, the warm and hot air bath, and all the nauseating and emetic substances, the depressing action of which is invariably attended by free perspiration. Then again we must refer to what are known as adjuvant remedies, such as warmth to the surface, diluent drinks, &c.

beneficial effects must no doubt be due to its action on the skin.

In eruptive fevers, when the eruption is not sufficiently developed, we endeavour to excite the function of the skin, and thus favour the local manifestation of the poison, by warm baths, cold packing, and possibly by phosphorus. We also use diaphoretics to favour absorption, as in various dropsies, and to relieve the kidneys, between which and the skin so much sympathy exists.

They are also of service by assisting to eliminate morbid products from the blood. When the various internal organs, whose duty it is to get rid of certain effete and hurtful matters, are temporarily or permanently off work, we may hope to supply their place in some measure by the skin, and in Bright's disease we may thus relieve the system of some urea, in jaundice of biliary products, &c.

ANHIDROTICS.

These are remedies which act in exactly the opposite way to diaphoretics, and which

Sweating is the natural termination of high fever, and marked relief always follows

check the perspiring action of the skin through different channels. Some, like atropine and hyoscyamine, go to work very directly by acting on the extremities of the nerves supplying the sudoriparous glands; others, such as oxide of zinc, the mineral acids, the application of cold, &c., probably check watery secretion from the skin by contracting the cutaneous blood-vessels. But sweating may be caused by mere debility, and in this case a little nourishment before going to bed or a moderate dose of alcohol may prove the most efficient remedy, and, in an indirect way, quinine and salicylic acid, and the cold bath, and other antipyretics, may be said to act as anhidrotics by diminishing the feverish state which is followed by perspiration.

the transition from the hot, dry skin to the cooling evaporation which attends copious perspiration. No one would ever dream of checking this natural process of 'resolution,' to use an old-fashioned term; and, indeed, in acute disease our principal therapeutic endeavour is to promote the efficient action of the skin. Any one who prescribed drugs with the view of checking the salutary flow from the perspiratory glands in pneumonia, or typhus, or ague, or acute rheumatism would be regarded as little better than a lunatic, and as one who was impeding the best efforts of nature towards recovery; and the use of anhidrotics has practically narrowed down to phthisis, in which the night-sweats serve no known useful purpose, but seriously depress and weaken the patient. In such cases atropine, oxide of zinc, and the mineral acids do good service.

CATECHU.

Physiological.

Catechu has powerful astringent properties.

Therapeutical.

It is a much-used drug in the relaxed conditions of various mucous membranes,

but more especially in diarrhœa, and it constitutes an essential ingredient in the mixtures generally prescribed for the relief of that condition.

℞ Tincturæ catechu ʒvj.; pulveris cretæ aromatici ʒij.; tincturæ opii ʒij.; mucilaginis ℥j.; aquæ cinnamomi ad ℥vj. Misce, fiat mistura, cujus sumat semunciam post singulas dejectiones liquidas.

VALERIAN.

Physiological.

Various elaborate investigations have been made in Germany on the physiological actions of valerian, but they have not much bearing on its practical application, and the drug itself is hardly of sufficient importance to justify us in devoting much time to its consideration. We may therefore say, generally, that acceleration of the action of the heart, mental hallucinations, giddiness, and some digestive derangement are among the principal of the symptoms described most fully by Phillips.

Therapeutical.

The more important therapeutic applications of valerian have not stood the test of time and experience, and its use is now practically restricted to hysteria and the various nervous conditions depending thereon.

SANTONIN.

Local Action.

Santonin has no local action.

Internal Actions.

Physiological.

I. *Brain and Nervous System.*—It is no doubt due to some influence on the brain that the peculiar derangement of vision accompanying the use of santonin depends, as no staining of the ocular media has been observed, and slight hyperæmia of the retina is the only apparent local effect. Some observers note the first stage to be an exaggerated appreciation of the violet rays of the spectrum, but the most evident alteration in sight consists in very distinct yellow vision, all white objects being seen with a more or less pronounced saffron tinge, which begins about half an hour after the drug is swallowed. Associated with this we find a diminished or even abolished appreciation of the violet rays of the spectrum. A good deal of lassitude and mental depression usually follows the use of this medicine, and it must be cautiously pushed, as large doses have occasionally proved fatal from tetanic spasms and coma.

Therapeutical.

I. Santonin has been recommended as a remedy for some affections of the optic nerve, but no trustworthy evidence has yet been adduced of its efficacy.

Santonin has not been used in any form of nerve disease, but it seems at least possible that it might prove of service in some forms of so-called colour blindness.

II. *Respiration and Circulation.*— No special influence on these functions has been noted.

III. *Secreting Organs.*— Slight digestive disturbance is usually experienced, indicated by nausea, headache, and general *malaise*.

Urinary Organs. — Remarkable effects are here noted, consisting of a bright yellow coloration of the urine, beginning five minutes after a few grains have been swallowed, persisting for two or three days, and communicating a stain to linen, as in the case of jaundice. Should the urine happen to be alkaline, the colour assumes a blood-red tinge, and the same change follows the addition of ammonia to the acid secretion. At the same time the flow of urine is increased, the patient experiences an irresistible desire to micturate, and in the case of children this may even give rise to complete temporary incontinence.

III. The real use of santonin in practice consists in its effect on the round worm, or ascaris lumbricoides, which it speedily destroys. It appears to have no influence over the tape-worm, and it is an open question with regard to its service in cases of ascaris vermicularis.

Santonin has been recommended as a remedy for incontinence of urine, but, although it is said to succeed occasionally in cases of this troublesome affection after other remedies have failed, careful

observation has convinced me that this assertion is entirely without foundation.

Mode of Elimination.

Santonin is supposed to combine with the soda in the blood, and to be slowly given out, in part at least, by the urine, under the form of xanthopsin.

Cautions. Mode of Administration.

As already observed, serious symptoms have been observed to follow the use of santonin, and we shall do well to warn our patients of the urinary irritability which is invariably experienced in greater or less degree. We must be somewhat cautious of its use, as a single 1½-grain dose caused convulsions and dyspnœa in a child of two, chloroform having been of service as an antidote. Dr. Sieveking has also drawn attention to the occurrence of urticaria following the administration of santonin, and Drs. Dyce and Ogston have given a suggestive hint by pointing out that its long-continued use causes the development of cataract in young animals. Its formation into xanthopsin is held to explain its occasionally poisonous action, and this may be prevented by combination with calomel and soda.

Dose 1 to 6 grains. Its taste is not unpleasant, but as it is insoluble in water, it may be mixed with jam or treacle, or simply sprinkled on bread and butter; or we may use the trochisci santonini, of which each contains gr. j.

ANTHEMIDIS FLORES ET OLEUM.

Camomile has usually been considered a substance of no special therapeutic interest, being principally used by country people in the form of infusion as a remedy for dyspepsia; but within more recent years various German authorities, quoted by Phillips, have stated that the oil has a powerful lowering

action on the reflex irritability of the spinal cord, and have proposed its use in cases of strychnia poisoning.

TARAXACUM.

Taraxacum is usually prescribed as a matter of routine in sluggish liver and the various forms of dyspepsia depending on a supposed deficiency of bile; but although it may have some mild tonic properties, there is not the slightest evidence for asserting that it exerts any real influence over the hepatic functions.

℞ Succi taraxaci ʒj.; acidi nitro-muriatici dil. ɱx.; tincturæ lupuli ɱxx.; aquæ ad ℥j. Ter die sumend.

The extractum taraxaci liquidum is a recent addition to the B. P. Dose, gr. v. to xxx.

ARNICA.

External Actions.

Physiological.

If applied to the skin for some time, arnica causes redness and irritation, and in some susceptible subjects most violent erysipelatous inflammation, even ending in death, has resulted. It must therefore be used with caution.

Therapeutical.

Some practitioners value arnica highly for the power which they believe it to possess of absorbing bruises and relieving sprains. Dr. Garrod, on the other hand, asserts that any power it seems to exercise in dispersing extravasations of blood is simply due to the spirit which the tincture contains. Dr. Phillips, again, tells us that the irritating effects never follow the use of an aqueous solution, which contains none of the arnicine or volatile oil.

Internal Actions.

The physiological and medicinal actions of arnica can only be balanced with difficulty, as the evidence regarding the former is very conflicting, and the opinions on the latter certainly err in the direction of over-confidence. As it is rarely, if ever, used as a medicinal agent save by homœopathic practitioners, it does not seem necessary to say more about its asserted virtues.

LOBELIA.

Lobelia possesses no local actions.

Internal Actions.

Physiological.

1. *Brain and Nervous System.*—In large doses lobelia frequently causes headache and giddiness, and may eventually extinguish life by paralysing the respiratory centre.

2. *Heart and Circulation.*—Lobelia depresses the action of the heart, and in this respect has a powerful affinity to tobacco.

3. *Respiration and Temperature.*—As already mentioned, lobelia in large doses is a respiratory depressant, but in ordinary medical practice it seems to relieve spasmodic conditions of the bronchial tubes.

It lowers the temperature

Therapeutical.

3. Lobelia is only used in medicine in this country as a remedy for various respiratory affections, and more especially spasmodic asthma. Its action here is apt to be uncertain, and it may unexpectedly cause much nausea and discomfort; but Ringer tells us that we

in some measure on account of its diaphoretic action.

4. *Secreting and Digestive Organs.* — Lobelia has undoubted emetic properties, and frequently causes vomiting, accompanied by much nausea and general depression.

Skin.—Lobelia excites the action of the skin.

Kidneys.—Lobelia is said to promote the excretion of watery fluid by the kidneys.

may employ it with great confidence by giving much larger doses than are usually prescribed.

Remember that its action in no way prevents the asthmatic attack, but merely cuts it short.

4. Lobelia is never used as an emetic, being slow, uncertain, and exhausting.

Dose.

Ringer tells us that the dose laid down in our usual text-books is much too small, and that we may freely administer a drachm of the ethereal tincture every hour, or 10 minims every ten minutes, with advantage, immediately before and during the asthmatical paroxysm.

The great drawback to its use is the occasional unpleasant symptoms following its administration, and which can be, unfortunately, neither foreseen nor prevented.

UVA URSI.

Physiological.

Uva ursi is astringent and possibly diuretic.

Therapeutical.

The astringency of this drug being principally directed

to the genito-urinary mucous membrane, it is held by surgeons to be of some service in various chronic affections of these parts.

GUTTA PERCHA.

Gutta percha is only adapted for external use, and is of service mechanically as a material for splints, being readily softened in hot water and moulded to the affected joint or limb. It furnishes a cheap and efficient rival to oiled silk, and its solution in chloroform forms a good and impervious covering in smallpox, erysipelas, and other affections where it is of importance to protect the skin from the action of the air.

BENZOIN AND BENZOIC ACID.

Local Action.

Physiological.

Tincture of benzoin is a stimulant to raw surfaces.

Therapeutical.

It is therefore occasionally used as an application to foul or indolent sores.

Internal Action.

Benzoin has the stimulating influence on mucous membranes possessed by most of the gum balsams. During its passage through the blood it becomes converted into hippuric acid, and increases in some measure the acidity of the urine. The benzoate of sodium is a powerful hepatic stimulant.

Benzoin may be prescribed with effect in advanced cases of bronchitis, and in some conditions of chronic irritation of the bladder.

It may be conveniently given in the form of the benzoate of ammonium.

℞ Tincturæ benzoini compositæ ʒvj.; mucilaginis acaciæ ℥j.; syrupi zingiberis ʒss.; aquæ menthæ piperitæ ℥vj. Misce, fiat mistura. Capiat unciam unam quartâ quâque horâ. For advanced bronchitis.

OLIVE OIL, HARD AND SOFT SOAP.

Olive oil is only used externally as an emollient application, and as the basis of various liniments.

Soap is not applied to any therapeutical purpose, but the hard variety enters into the construction of some pill masses, and both the hard and soft aid in the construction of liniments and plasters.

PARAFFINUM DURUM, PARAFFINUM MOLLE.

These enter into the preparation of eleven ointments contained in the B. P., and are extensively used in the construction of antiseptic gauze.

GLYCERINE.

This useful substance is almost exclusively used externally. It moistens and softens the skin, and both prevents and cures the painful and unsightly cracks known as 'chaps' on the hands. It is a serviceable application, either alone or combined with other drugs, in various forms of skin disease.

It may soothe an irritable cough by moistening the dryness of the throat, and it is stated to be the most efficient means at our command for the prevention of bedsores; being mildly laxative, it has been recommended in piles. In addition to this, it forms an excellent vehicle for the solution of various drugs, as seen in the eight glycerines of the Pharmacopœia; having this additional advantage, that its adhesive nature enables the active ingredient to remain longer than it otherwise

would in contact with the affected surface. It is also a good solvent of the alkaloids, dissolving them freely, and, being decidedly antiseptic, it is now used for the preservation of vaccine lymph.

Some remarkable experiments have been recently made regarding the physiological action of glycerine. MM. Dujardin-Beaumetz and Audige, working in Vulpian's laboratory, found that by hypodermic injection it causes tetanic rigidity resembling that caused by strychnine, with rise of temperature, hæmaturia, and meningeal injection; and M. Cattillon found that internally it increased the appetite, promoted nutrition, and lessened the excretion of urea. It would therefore seem to be a good nutrient, although unfortunately of no use in diabetes.

Internal Use.

It was thought at one time that glycerine might prove an agreeable and efficient substitute for cod-liver oil; but this has not been confirmed, and glycerine is now seldom used internally.

MANNA

has very slight purgative properties.

NUX VOMICA AND ITS ALKALOID STRYCHNINE.

Local Action.

No special local action has been noted.

Constitutional Action.

Physiological.

1. *Brain and Nervous System.*—No effect is produced on the brain, the cerebral

Therapeutical.

functions remaining unimpaired almost up to the close of a case of strychnine poisoning.

The spinal cord, however, is early attacked, and violent and distressing tetanic spasms prove the irritating influence of the drug, more especially on the reflex excitability of that organ.

In large doses strychnine also paralyses the efferent motor nerves, causing loss of power of voluntary movement.

The sympathetic system is stimulated.

It probably stimulates the vaso-motor centre, raises the blood pressure, aids oxidation, and removes the products of waste, making the respiratory movements quicker and deeper, and delaying putrefaction.

1. Nux vomica, and more especially strychnine, are excellent nervine tonics, acting well in simple debility, nervous exhaustion, and incontinence of urine, and promoting the return of function after some forms of paralysis. When all inflammatory symptoms have subsided, strychnine may be prescribed in the hope of stimulating the spine to resume its duties, and restoring tone to muscles which long remained in a state of inactivity. Thus in paraplegia, hemiplegia, diphtheritic paralysis, and wrist-drop, strychnine may well go hand in hand with galvanism when all evidence of irritation of the nervous structures has completely disappeared. Trousseau, Hammond, and Finny, of Dublin, praise it in chorea. Mr. Barwell has proposed subcutaneous injections of strychnine in infantile paralysis, using a large dose ($\frac{1}{16}$ to $\frac{1}{12}$ gr.), and forcing the fluid freely into the muscular structures.

Annandale, of Edinburgh,

has recorded an interesting case of writer's palsy successfully treated by subcutaneous injections of strychnine, using equal parts of the liquor and water, injecting ♏vj. every second day, and gradually increasing the dose until ♏xij. was reached, the injections being made into the flexors and extensors of the fore-arm.

2. *Heart and Circulation.* —Strychnine causes rise of arterial pressure and contraction of the capillaries.

2. It is an excellent heart tonic.

3. *Respiration and Temperature.* — The interference with breathing observed in strychnine poisoning, and which usually terminates the life of the victim, is due to spasmodic fixation of the diaphragm and respiratory muscles.

3. Thorowgood praises strychnia and nux vomica most enthusiastically in paralytic and emphysematous asthma.

4. *Digestive and Secreting Organs.* — Strychnine has a tonic influence over the digestive process, aiding oxidation, removing the products of waste, and delaying putrefaction.

4. Strychnine, and more especially nux vomica, are excellent tonics, improving the appetite in a marked degree; but, in addition to this, nux vomica is of great service in various dyspeptic conditions, relieving heartburn, nausea, and flatulence, and being also a reliable remedy in sick headache and the vomiting of pregnancy. It is an excellent

addition to purgative pill masses, improving the tone of the muscular wall of the intestines and relieving constipation.

Poisonous Effects.—As already stated, strychnine kills by inducing hyper-excitability of the reflex functions of the spine, with violent tetanic spasms, leading to death by exhaustion or suffocation. The fatal event may take place in a few minutes if the dose be a large one, and the minimum quantity required to destroy life is about half a grain. Contrary to the habit of other poisonous drugs, strychnine acts most rapidly and efficiently when given by the rectum.

Antidotes.—In a case of strychnine poisoning, we may first administer tannin, which places the drug in an insoluble form, and after evacuation of the stomach it will be necessary to try the physiological antidotes. These are chloral, bromide of potassium, Calabar bean, and nicotine, tobacco enemata, although the use of the last-mentioned remedy must be conducted with extreme caution. Finally we may have recourse to artificial respiration.

Dose, Mode of Administration, &c.

The dose of strychnine may be put at from $\frac{1}{30}$ gr. to $\frac{1}{12}$ gr., and the solution is a convenient form, in doses of from 5 to 10 minims, added to an ordinary tonic mixture. We are usually advised to suspend its administration from time to time, as it is stated that uncomfortable twitchings and rigidity about the jaw may suddenly arise, giving evidence of the so-called 'accumulation' of the drug.

The dose of nux vomica is of the tincture 5 to 10 minims, of the extract gr. $\frac{1}{4}$ to gr. ij.

By hypodermic injection we are usually taught that $\frac{1}{120}$ gr. is the proper dose, and it is therefore difficult to explain why no poisonous results followed Barwell's somewhat heroic medication.

℞ Ferri sulph. exsicc. ℈ij.; quininæ sulph. ℈ij.; strychninæ sulph. gr. ss.; mannæ q.s. ut fiant pilulæ xx. Sumat unam ter die. A useful tonic pill.

℞ Tinct. nucis vomicæ ʒj.; acidi nitro-hydrochlorici diluti ʒij.; spiritûs chloroformi ʒj.; infusi gentianæ ad ℥vj. ℥j. ter die sumend. For flatulent colic, taken after meals.

℞ Ferri sulph., ext. nucis vom., āā gr. ss.; ext. aloes barb. gr. iij. Fiat pil. ante cibum sumenda. A good 'dinner pill.'

GENTIAN AND CHIRETTA.

These two drugs may be grouped together, as their action is almost precisely similar. They are both light, agreeable tonics, with pleasant aromatic bitter flavour, and may be used freely in dyspepsia and debility with loss of appetite. Gentian has always, however, been much more generally employed than chiretta, and this may be partly due to the very agreeable compound preparations of the former drug.

SCAMMONIÆ RADIX ET RESINA.

Physiological Action.

Scammony causes a good deal of irritation of the alimentary canal, and produces copious watery stools, often attended with griping. For its proper action previous solution in the bile and combination with its soda are requisite. The researches of Rutherford have proved that scammony is a powerful intestinal but a feeble hepatic stimulant.

Therapeutical Action.

Scammony is a purgative used in cerebral and dropsical affections; and, being comparatively tasteless, it is well adapted for children, forming a convenient purgative for the removal of ascarides.

JALAP.

Physiological Action.

The action of jalap resembles that of scammony, only differing in being less irritant and more effectual in promoting the flow of watery fluids from the bowels.

Rutherford shows that jalap is a 'moderately powerful hepatic, and a powerful intestinal stimulant.'

Therapeutical Action.

Jalap is undoubtedly one of our best hydragogue cathartics, and is much used in cerebral lesions, in kidney disease where the excretion of effete products threatens to become suspended and when dropsy is setting in; in such cases smart purgation by pulv. jalapæ co. gr. xxx. ad ʒj. will often produce striking benefit.

In cardiac disease also, when the right side of the heart is engorged by emphysema or bronchitis, free catharsis will unload the distended and labouring organ, and relieve the condition of intense dyspnœa, with the cold and livid surface and indications of approaching death. Jalap also acts well as an ordinary or habitual purgative, and is generally prescribed in the form of the compound powder, containing cream of tartar and ginger (dose gr. xxx. ad ʒj.).

CAPSICUM.

This is a topical stimulant to the mucous membranes, exciting the appetite in small doses, but in larger quantities

causing gastro-enteritis. In some forms of sore throat, as in the early stage of tonsillitis, or in simple relaxation of the mucous membrane, it forms a useful addition to a gargle.

Recently it has been highly praised by Dr. Lyons, of Dublin, in 10-minim doses of the tincture before meals, for the relief of the nausea, depression, and drink-craving of confirmed dipsomaniacs.

℞ Tincturæ capsici, tincturæ nucis vomicæ, āā ♏x.; acidi nitrici diluti ♏xx.; aquæ ad ℥j. Fiat haustus ter die sumendus. Useful in drink-craving.

BELLADONNA.

Local Action.

Belladonna is used externally, on account of its soothing properties, in various forms of *neuralgic* and *rheumatic pains*, in which cases the liniment, applied either alone or in combination with chloroform liniment, often gives relief. It is also a good application in acute rheumatism, placed on cotton-wool, and thus encasing the swollen and tender joints. Belladonna is also useful, as has been especially pointed out by Mr. Heath, in *boils* and *abscesses*, where the suppurative process may be prevented or even arrested by its use. It is also a good application to inflamed *piles* and *fissure of the rectum*. It is also applied to the skin to check localised sweating, to the breast to arrest the secretion of milk, and to the neighbourhood of the eye to dilate the pupil; but its actions here are so intimately associated with the theory of its internal administration that we will say no more on the subject at present.

Belladonna is very readily absorbed through the unbroken cuticle, and symptoms of poisoning have occasionally been caused by its local application.

Internal Administration.

Physiological Action.

1. *On the Brain.*—After full doses of belladonna, a tendency to delirium sets in, usually of a joyful character, and attended by hallucinations and spectral illusions. Sleep generally follows.

2. *On the Spinal Cord.*—In frogs this action is very decided, for when atropine is injected below the skin the animal is at first paralysed, lying quite motionless, with arrested breathing, which period of inaction is suddenly interrupted in about from one to eighteen hours by the occurrence of violent tetanic spasms.

3. Belladonna paralyses the terminal filaments of the third nerve supplied to the circular or sphincter fibres of the iris, and thus allows the sympathetic, which rules over the radiating fibres, to come into unchecked play, and so dilate the pupil. At the same time we observe a diminution in ocular tension and imperfect vision, especially for near objects, due to paralysis of the power of accommodation.

Therapeutical Application.

1. Belladonna may be cautiously used as an hypnotic when other remedies fail. Ringer records an interesting case of acute mania in which the heroic dose of gr. j. of atropine acted well by causing sleep.

2. It is used in some spinal affections in accordance with the principles of Dr. Brown-Séquard, explained under another section.

It is also of value in checking the tendency which occasionally exists to nocturnal seminal emissions, when these become of exhausting frequency.

3. Belladonna, used more conveniently in the cleaner form of atropine, is in very extensive use in eye diseases to facilitate ophthalmoscopic examinations, to keep the pupil freely dilated in iritis, and so lessen the risk of adhesion of its free margin to the lens, with subsequent contraction, distortion, and impairment of vision.

It is also used to obviate protrusion of the iris through

Gubler says that it also causes a diminished sensibility of the cornea and retina, with prolonged retention of images by the retina. He is rather inclined to believe that it has some special action on the muscular tissue of the iris.

The strong solution of the B.P. must be used with caution, as acute glaucoma has undoubtedly followed its free application to the eye. Be careful to use perfectly fresh solutions, as fungi rapidly form, and may cause troublesome irritation ; and the liq. atropinæ sulph. is a more stable preparation than the liq. atropinæ, which is irritating because of the spirit which it contains.

any hole in the cornea made by ulceration or accident, and it forms a soothing application in various painful affections.

To dilate the pupil the liq. atropinæ sulph. is now generally used, care being taken only to introduce a very small drop into the eye; for if a larger quantity is applied, the resulting effects and inconveniences, more especially the paralysis of accommodation spoiling the eye for near work, may last from a week to twelve days, much to the annoyance of the patient. Although weaker solutions take a little longer time to dilate the pupil and paralyse the accommodation, yet these effects are more transient and therefore more satisfactory to the patient. A $\frac{1}{4}$ gr. solution is strong enough for ordinary use, and will dilate the pupil in about half an hour after instillation.

Belladonna being so readily absorbed, however, dilatation of the pupil will ensue on application of the extract or liniment for any length of time to any part of the body. When we wish rapid and

transient dilatation of the pupil without complete relaxation of the ciliary muscle, we should use homatropine, in reference to atropine.

4. The action of belladonna on the sympathetic nervous system is somewhat irregular, and to this is no doubt due some at least of that action on certain secretions which we shall shortly note more fully. But one symptom often observed, more especially in children, probably proceeds from vaso-motor paralysis, and that is transient flushing and sweating of the face now and then following a dose.

5. The influence of belladonna on the circulation is due to another nervous influence. Under the use of this drug we increase rapidity and force of cardiac action, and this is explained by a paralysing action which it exerts on the terminal inhibitory filaments of the pneumogastric nerve distributed to the intimate structure of the heart, as well as on the nerve itself, thus differing from curare, which only affects the trunk of the nerve. It is proved by experiment that the sympathetic nerve supply has

5. Belladonna is an excellent cardiac tonic, increasing the regularity and strength of the contractions of the heart, more especially in failure of compensation in cases of mitral regurgitation. It is good practice to combine it with digitalis.

It is also a very soothing remedy in cases of irritable palpitation, and the old-fashioned belladonna plaster is certainly of use in these conditions.

the power of causing very rapid action of the heart; but a rein is kept on this, and the proper balance of motive force is sustained by the pneumogastric nerve, which inhibits or restrains the impetuous action of the sympathetic. By paralysing these inhibitory filaments, then, belladonna hands the heart over to the sympathetic, which, without rein or drag, runs riot, and we accordingly find that excessive increase in the heart's rapidity follows the injection of a moderate quantity of atropine.

Coincident with this we get raised arterial tension.

6. Belladonna contracts the small vessels, probably not from nervous influence, but from a direct action upon the unstriped muscular fibre surrounding the arterioles.

6. Dr. Brown-Séquard recommends the use of belladonna in those cases of chronic inflammation of the spine leading to paralysis, where it acts well by contracting the vessels and diminishing the supply of blood to the affected part; and he gives it internally, and applies a plaster along the spine.

To this contracting influence on the small vessels is probably due the effect of belladonna in checking local inflammatory conditions.

7. *On Respiration.*—Bel-

7. Atropine has been re-

ladonna tends to increase the rapidity of the breathing by stimulation of the respiratory centre.

8. It has the power of contracting unstriped muscular fibre in other situations than the arterial tubes. It probably does so both in the bladder and intestines, and it should be remembered that in cases where the expulsive power of the bladder is naturally weak complete retention of urine may be produced by its administration.

Action on Secretion.—9. *Salivary.*—It checks the salivary secretion, causing a peculiar sensation of dryness in the mouth and throat; and this is believed to be due to a remarkable selective action

commended as an efficient remedy in asthma.

8. Belladonna is an excellent remedy for the nocturnal incontinence of urine of children; but in order to do any good it must be boldly pushed, and I have been obliged to give as much as f℥jss. or even f℥ij. of the tincture before success was attained.

From its tonic influence on the muscular structures of the intestines, it is an excellent adjunct to purgative pill masses, from $\frac{1}{4}$ to $\frac{1}{2}$ grain acting well in combination with colocynth; or, even given alone with ext. gentianæ, it will often secure a regular action of the bowels.

It is also very useful by relieving spasm, as in colic, and intestinal obstruction has occasionally yielded to large doses.

9. Belladonna has been used to check excessive salivation.

on the secretory branches supplied from the chorda tympani nerve to the submaxillary ganglion.

10. *Cutaneous.* — Belladonna most effectually arrests the action of the skin, and occasionally under its use a vivid red eruption, not unlike scarlet fever, breaks out.

Its anhidrotic action is explained by its paralysing the ends of the nerves supplying the sweat glands.

10. It is an excellent remedy for undue sweating, whether general, as in phthisis, as originally recommended by Bartholow and Da Costa, or in rheumatism, or local, as about the head of rickety children or the feet of some individuals. It may be either given in the form of succus, extract, or tincture, or better by the subcutaneous injection of atropine.

11. It also checks the secretion of the milk, either locally or by internal use, and this is probably due to a paralysing effect on the lacteal nerves.

11. It is a most valuable remedy in cases where inflammation threatens in a breast, when the child has died or cannot suck, and the gland becomes congested from retention of its secretion. Here the external application of belladonna speedily diminishes the red, tense, shining aspect, relieves the wearing pain, and arrests the milk.

12. On the solid urinary constituents no special action has been noted, but it increases the flow by raising the tension in the glomeruli of the Malpighian bodies.

12. It may therefore be recommended as a good diuretic.

Belladonna is also used under one or two conditions which cannot accurately be grouped under any specific heading.

Thus it has been vaunted in whooping-cough, but after careful and repeated trials with large and small doses I am compelled to agree with Dr. Kelly that its action in this disease is too uncertain to be of much use. But in certain forms of spasmodic cough simulating pertussis, or when the cough is merely an occasional loud clanging bark, I have derived much benefit from belladonna. In epilepsy and chorea it has been tried, but without marked success.

The subcutaneous injection of atropine is said by Dr. Anstie to be of great service in lumbago, sciatica, and chronic rheumatism, and to be the best of all remedies for pain in the pelvic viscera. It has also been recently observed that the addition of a little atropine to the ordinary morphine injection tends to obviate the distressing faintness, pallor, and nausea which occasionally mar the efficacy of the subcutaneous mode of administering this valuable drug. Ringer recommends its use in irritative dyspepsia, giving from $\frac{1}{6}$ to $\frac{1}{4}$ gr. of the extract night and morning, and gradually increasing the dose. A solution of atropine 1 in 100, if applied to an exposed nerve-pulp, is said to relieve toothache immediately.

Drawbacks to the Use of Belladonna.

Poisonous Symptoms and Antidotes.—Occasionally the use of atropine drops to the eye causes an erysipelatous inflammation about the lids and face, and patients often complain of the disfigurement and inconvenience arising from a widely dilated pupil. Liebreich ('St. Thos. Hosp. Rep.,' vol. vii.) points out that the poisonous symptoms of atropine are occasionally developed by its introduction into the eye, and that they are due, not so much to absorption by the conjunctiva as to the fluid trickling through the lachrymal ducts into the nose, throat, and stomach. This may be avoided by telling the patient to rinse his throat occasionally. He also notes

conjunctivitis, erythema, eczema, and peculiar pearly granulations on the conjunctivæ from the long-continued use of these drops. Minor degrees of belladonna poisoning, however, need give us no uneasiness. Idiosyncrasy may also here be the source of inconvenience, and we may find persons affected with dryness of the mouth and throat after very small doses. This is always the first indication of the physiological action of belladonna, and is followed by a peculiar sensation of thirst and feverishness, without heightened temperature, rapid pulse and breathing, red tongue; the face then flushes, delirium sets in, with great weakness, very hurried breathing, convulsions, and finally coma, which ends the scene. The antidotes are opium, which, within certain limits, is antagonistic to its poisonous properties, and Calabar bean, which has recently been shown to be the physiological antidote. A direct physiological antagonism has also been shown to exist between atropine, muscarine, and jaborandi, or pilocarpine, which stimulate the intracardiac inhibitory apparatus and slow the heart.

One curious point about belladonna is that, although so poisonous to man, its destructive influence is very various on other animals. The carnivora are much more readily affected by it than the herbivora, many of whom browse on it with impunity. Thus a horse has been known to eat eight pounds of the leaves without injury; blackbirds feed freely on the berries; and 15 grains of atropine are required to poison a rabbit.

Dose and Mode of Administration.

Atropine may be given in phthisical sweating in pill, in doses varying from $\frac{1}{400}$ grain (Bartholow) to gr. $\frac{1}{75}$ to $\frac{1}{25}$ (Da Costa); but it is not very often used internally. In heart disease $\frac{1}{50}$ gr. of digitaline may be combined with $\frac{1}{60}$ gr. of atropine, and given by hypodermic injection. Discs of atropine (lamellæ atropinæ) have recently been admitted to the B. P. They are composed of gelatine and glycerine, and each contains gr. $\frac{1}{5000}$ of sulphate of atropine.

It is well to note that children take not only without injury, but with benefit, much larger doses than adults, and, whilst I have seen a woman display well-marked physiological symptoms after a few 10-minim doses, I have often prescribed 20 minims of the tincture of belladonna for a child of two years without anything of the kind. The official preparations of belladonna are—

	Dose.
Extractum	gr. $\frac{1}{4}$ to gr. j.
Extractum alcoholicum	gr. $\frac{1}{16}$ to $\frac{1}{4}$.
Tinctura	♏ v. to ʒj.
Succus	♏ v. to xv.
Linimentum	
Emplastrum.	
Unguentum.	

Asthma Cigarettes.

℞ Belladonnæ fol.	gr. xcvj.
Hyoscyami fol.,	
Stramonii fol., āā	gr. xlviij.
Ext. opii	gr. iv.
Tabaci fol.	gr. lxxx.
Aquæ	Oj.
Ft. infusum et add.	
Potass. nitrat.	ʒij. ℈ij.
Potass. arsenitis	ʒv. ℈j.

M. S. Saturate sheets of bibulous paper in this solution, dry and roll them, and use for fumigation as directed.—*Phila. Hosp.*

STRAMONII FOLIA.

After the careful description already given of the actions and use of belladonna, it is unnecessary to say much about stramonium. Modern investigation has shown that the active principle, datura, is identical with atropine; and the only marked difference between the two plants seems to consist in the more decided antispasmodic properties of stramonium, which cause it to be much prized as a remedy for asthma.

In the purely spasmodic varieties of that disease, and most efficiently when inhaled in the form of smoke, it seldom fails to give relief.

HYOSCYAMUS.

The remarks just made with reference to stramonium are equally applicable to hyoscyamus, which also contains an alkaloid, hyoscyamine, probably identical with atropine. The main point of difference, then, from belladonna is the superior narcotic powers of hyoscyamus, which have been especially prized and developed in lunacy practice. It is also a favourite remedy in painful and irritable affections of the bladder, where it seems to exert a marked soothing influence, and as an expectorant it is an excellent addition to cough mixtures.

℞ Extracti belladonnæ gr. iij.; camphoræ gr. xij.; extracti hyoscyami gr. xv. Misce, fiant pilulæ sex, quarum sumat unam horâ decubitûs. Narcotic.

℞ Tincturæ hyoscyami ♏xxx.; potassii carbonatis gr. x.; syrupi papaveris ʒij.; aquæ camphoræ ad ℥jss. Misce, fiat haustus horâ somni sumendus. Narcotic.

℞ Vini ipecacuanhæ ʒij.; succi hyoscyami ʒvj.; tincturæ scillæ ℥ss.; syrupi tolutani ℥j.; aquæ carui ad ℥vj. Misce. Cap. semunciam ter quaterve in die. Cough mixture.

Dr. Robert Lawson, late of the West Riding Asylum, has made a large variety of very interesting physiological and therapeutical observations on the actions and uses of hyoscyamine, the alkaloid of hyoscyamus. He has found that it produces a 'subdued form of mania, accompanied by almost complete paralysis of the voluntary muscles, and ending in quiet and refreshing sleep;' and he thinks that this might advantageously be substituted for many forms of extreme excitement occurring amongst the insane. He has derived great benefit from the drug in the 'treatment of recurrent, acute, and subacute mania, and the monomania of suspicion,' and recommends the following formula:—

℞ Hyoscyaminæ gr. j.; sp. ætheris ℥viij.; alcohol ℥xxiv.; aq. font. ad ℥j. Misce, ut fiat haustus.

Ringer records a very interesting case of acute mania in which gr. j. of hyoscyamine quieted the patient and produced sleep, the first dose causing deep flushing of the face and hands, with quickening of the pulse. He has found it useless in *delirium tremens*. Mr. Clifford Gill, of the York Asylum, has made many observations on the drug, finding that physiologically it causes loquacious rambling, hallucination of sight and hearing, drowsiness, hypermetropia, dryness of mouth, and deficient co-ordination of lower limbs. In violent mania it acts well, but as some persons are intolerant of its action, and as death has been caused by syncope, we must proceed cautiously, and begin with small doses (gr. $\frac{1}{8}$–$\frac{3}{8}$). The pure alkaloid is expensive, but an efficacious extract containing the amorphous salt is made by Mercks; and Gill recommends a solution of gr. ij. to ℥j. of ether and alcohol, freshly prepared; as it soon deteriorates it must be kept from the light. It has also been used with some success in chorea.

PUPIL CONTRACTORS.

The drugs possessing this influence when locally applied are believed to act by stimulating the fibres of the third nerve supplied to the circular or sphincter muscle of the iris. The principal members of the group are Calabar bean and pilocarpine, and they have their uses in ophthalmic surgery. Some drugs, such as opium and conium, contract the pupil when taken internally, the former from a central action dependent on its poisonous properties, the latter from acting on the third nerve; and gelsemium and muscarine, which locally dilate the pupil, contract it when administered by the mouth.

PUPIL DILATORS.

Direct antagonists to Calabar bean and pilocarpine are atropine and muscarine, which paralyse the third nerve and dilate the pupil; and the same property is possessed by stramonium, hyoscyamus, and gelsemium.

Cocaine dilates the pupil by stimulating the sympathetic.

TABACI FOLIA (TOBACCO).

Tobacco is now rarely if ever used in medicine, on account of its poisonous properties; but it is a substance in such general domestic use, and therefore of so great physiological interest, that we must devote some little space to considering the results of modern experiment on its action.

Local Action.

Physiological.

Tobacco is readily absorbed by the skin, and symptoms of poisoning have followed the application of strong infusions to the unbroken cuticle.

Therapeutical.

Tobacco has been used as a local application in prurigo and other skin diseases, but is too readily absorbed to deserve recommendation for this purpose.

Internal Action.

I. *Brain and Nervous System.*—The brain seems to be little affected, but some excitement of the spine is an early symptom of the poisonous action of the drug, speedily followed, however, by muscu-

1. Before the introduction of chloroform, advantage was taken of the depressing and relaxing influence of tobacco on the muscular system to employ the enema in strangulated hernia and dislocations.

lar relaxation and paralysis, also of spinal origin.

The sensory nerves are not affected, and we find lowering of the functional activity of the motor nerves. The pupil is contracted.

The use of tobacco is believed to have some injurious effect on vision; and Hutchinson and others have recorded instances of atrophy of the optic nerve and total blindness thus produced. Amblyopia and colour-blindness are said to be common in smokers.

2. *Circulation, Respiration, &c.*—It is not necessary for us to go into the elaborate and contradictory series of experiments made to prove the fact that tobacco is a powerful depressant of the heart's action. Cardiac irritability is not uncommon. The temperature usually falls in tobacco poisoning, and death ensues from respiratory paralysis.

3. *Digestive and Secreting Organs.*—Tobacco usually causes nausea and vomiting, as most smokers can testify; but toleration is soon established, and even considerable doses then fail to disturb the Any occasional success, however, was amply counterbalanced by the inconveniences and even dangers which too often resulted; and this application of the drug has now fallen into well-merited oblivion.

In consequence of its lowering action on the reflex function of the spinal cord, it has been proposed as a remedy for tetanus and an antidote for strychnine, and the alkaloid nicotine will be found most convenient for these purposes.

2. Tobacco smoking has been known to give relief in asthma and chronic bronchitis.

equanimity of the digestive organs, save a slightly purgative action on the bowels. It is stated, however, that in habitual smokers some symptoms of dyspepsia may be detected, indicated by furred tongue and loss of appetite; and there is also some generally diffused granular irritation about the pharynx.

Moderate smoking as a rule aids digestion by acting as an aperient.

FOXGLOVE.

Poisonous Effects.

Digitalis kills by tetanising the heart muscle, causing rapid and irregular action, followed by arrest of action. The face grows pale, the pupils dilate, vomiting and diarrhœa supervene, and death usually occurs by syncope. Cases of poisoning, however, are rare, and most of our knowledge under this heading has been derived from experiments on animals.

Antidotes.

After evacuation of the stomach and the administration of tannin, we must obviate the tendency to death by stimulants, and by keeping the patient rigidly to the horizontal posture, as syncope is readily excited by suddenly sitting up.

Aconite and atropine have been recommended as physiological antidotes, but we have as yet no evidence of their efficacy.

Local Action.

Physiological.

Digitalis has been said to possess sedative properties

Therapeutical.

Digitalis has been used as a local sedative in cases of

when locally applied, and there is no doubt that it is rapidly and efficiently absorbed by the skin.

joint inflammation; and the application to the legs of spongiopiline soaked in a strong infusion has been found to produce diuresis where other remedies have failed.

Constitutional Action.

Physiological.

I. *Brain and Spinal Cord.*—On the brain no direct effect is produced, but the reflex irritability of the spinal cord seems to be somewhat lessened under the tonic action of the drug.

Stimulation of some portions of the vaso-motor and pneumogastric nerves seems to take place, as we shall explain more fully when treating of the influence of digitalis over the heart.

Therapeutical.

I. Although no direct action is produced on the brain tissue, it is reasonable to suppose that some alteration in cerebral functions may follow the alterations in the vascular system produced by digitalis, and perhaps this may in part explain the remarkable results obtained by Mr. Jones, of Jersey, in the treatment of *delirium tremens* by the use of this drug. He found that half-ounce doses of the tincture quieted the delirium, reduced fever, and caused sleep. But this treatment can hardly be recommended, as several sudden deaths have been thus produced, and as it seems not improbable that the absence of toxic effects in many cases is due to the very partial absorption of the remedy.

II. *Heart and Circulation.*—Digitalis exerts a decidedly tonic and strengthening influence on the heart, rendering its beats slower and more forcible, and lengthening the period of systole. It therefore not only gives rest to the wearied organ, but also aids its nutrition by enabling the coronary arteries to do their work of supplying blood to the heart's muscle more efficiently during the prolonged diastolic pause. This result seems to depend partly on a direct action on the heart's muscle itself, but also in some degree on stimulation of the cardiac inhibitory fibres of the vagus, which thus hold more forcibly in check the rapid rate of pulsation produced by the sympathetic nerves. If, however, the administration of the remedy be too long continued, exhaustion of the pneumogastric is apt to follow this over-stimulation, and the heart, being now handed over to the unrestrained power of the vaso-motor nerve supply, runs riot in excessively rapid and feeble contractions.

The tonic influence of digitalis is attended by well-

II. The undoubted effect of digitalis in slowing and strengthening the action of the heart would seem to indicate its use in certain diseased conditions of the organ, but it is only recently that this tonic influence has been recognised. In former years digitalis was looked upon as essentially a cardiac sedative, and was used to quiet the tumultuous palpitation of hypertrophy; but we now know that it may be prescribed with much greater success under the following circumstances:—

1. In *palpitation* and *irregular action of the heart*, whether depending on organic disease or not, an important indication for its use being intermittence, or the occurrence of frequent beats which do not reach the pulse.

2. In *mitral disease*, where the cardiac action is feeble, and apparently unable effectually to propel the blood, where lividity and dropsy are setting in, the lungs becoming engorged and the right heart oppressed.

Here we shall derive the most signal service from digi-

marked rise of arterial tension, and this is supposed to depend on stimulation of the sympathetic centres directly supplying the smaller vessels; and at the same time the heart is induced to act more powerfully, to overcome the increased resistance in front.

talis given in moderate doses, and combined with a little iron. Dr. B. Foster ascribes some of the good effects of digitalis in mitral disease to its slowing action, giving more time for the auricle to empty itself fully of its contained blood.

The contracting effect of digitalis on the arterioles would naturally suggest its use in *hæmorrhage*, and it has accordingly been found of service both in *hæmoptysis* and *menorrhagia*, although in neither is it so efficacious as ergot.

3. In *dilatation of the heart*, where the weak and thin muscle acts feebly and irregularly, giving rise to palpitation and breathlessness, and causing temporary *bruits* by unequal and ineffectual closure of the mitral and tricuspid valves.

4. In *aortic disease*, when compensation has not been made complete by hypertrophy.

In short, we may use digitalis whenever the heart is acting feebly and irregularly, but by its use we cannot expect to spur on a normally

constituted heart with sound muscle to overcome difficulties in front, and we must avoid its regular use in the compensatory hypertrophy of aortic disease, and in *fatty degeneration*, where its tightening effect on the smaller vessels throws an injuriously increased amount of work on the structurally damaged organ.

5. Ringer has drawn attention to the beneficial action of the temporary use of digitalis in relieving the distressing attacks of *palpitation*, so often due to hypertrophy of the heart.

6. Clifford Allbutt believes it to be the best remedy for aneurysm, given in increasing doses, till the pulse comes down to 45, and continued as long as possible.

III. *Respiration and Temperature.*—On respiration no effect is produced, and although, in a state of health, digitalis does not lower the body heat, it undoubtedly possesses this influence over febrile conditions, Wunderlich and others bringing ample evidence to prove its power of reducing temperature in

III. Digitalis has been found of great service in those cases of *bronchitis* which are so frequently associated with a weak and dilated right heart, and where stimulation of the cardiac muscle leads to a better arrangement of circulation through the lungs.

For the reduction of temperature digitalis is seldom

pneumonia, enteric fever, acute rheumatism, and other acute disorders.

Binz holds that digitalis is no trustworthy antipyretic, as its action does not begin for thirty-six to sixty hours (Traube), and as it is uncertain and disturbs digestion.

used in this country, but in Germany its antipyretic virtues are prized. It seems, however, to lower the body heat without influencing the course of the disease; and as it must be given in large doses, which may derange the digestive functions even if they do not prove directly dangerous, there does not seem to be any real benefit following its employment.

IV. *Digestive and Secreting Organs.*—1. *Stomach and Intestines.*—From its bitter taste, digitalis might be credited with some tonic properties; but it is really much more likely to disorder than to increase the appetite, by causing vomiting.

It does not seem to affect the intestinal tract in any way, save in the later stages of poisoning, when diarrhœa may supervene.

2. *Kidneys.*—Digitalis increases, under certain conditions, the flow of urine without altering in any essential respect the quantity or proportion of its solid ingredients. Its diuretic action depends partly on the tightening effect on the arterioles, raising the

2. Digitalis is a good diuretic, more especially in *cardiac* and *acute renal dropsy*, and acts best in combination with squill and mercury, as in the famous Guy's Pill. The theory of this action, depending on heightened blood pressure

blood pressure in the renal glomeruli, and partly on the increased power and regularity of the heart, improving the general condition of circulation within the kidneys. One curious point in this connection is that digitalis will seldom produce diuresis in healthy persons, but always acts best when dropsical accumulations have to be removed.

within the Malpighian tufts, explains the frequent failure of digitalis to augment the quantity of the urine in chronic kidney disease, where the arterial tension is already high.

V. *Uterus.* — Digitalis, from its action on unstriped muscular fibre, has the property of stimulating the uterus to contraction.

V. It has, therefore, been used to contract the uterus, and thus check flooding or *menorrhagia*, and it may also act by restoring its normal functions, when these are suspended, as in *amenorrhœa*.

Cautions, Mode of Administration, &c.

In prescribing digitalis we are generally advised to suspend its use from time to time, lest 'accumulation' lead to poisonous symptoms; and experience must have shown us that, after its prolonged use, uncomfortable symptoms do arise. This may be due to elimination from the kidneys being prevented in some measure by the contracting influence of the drug on the renal arteries, as we find that so-called accumulation only takes place when urine is not passed freely.

It is therefore advisable during the administration of digitalis to examine the urine from time to time, so as to satisfy ourselves that the eliminatory functions of the kidneys are being properly performed.

As regards the best form for its administration the freshly made infusion is usually preferred.

℞ Tinct. digitalis . . . . ♏x.
Sp. æth. nit. . . . . f ʒss.
Inf. buchu . . . . . f ℥j.

S. Ter in die.

Recommended by Fothergill in *simple cardiac debility*, with scanty flow of urine.

℞ Pulv. digitalis . . . . gr. xxx.
Ferri sulph. exsic. . . . gr. xv.
Pulv. capsici . . . . gr. xl.
Pil. aloes et myrrhæ . . . ʒij.

In pil. lx. div. Una bis in die.

Recommended by Fothergill in *cardiac debility*, *gastric catarrh*, and *inactivity of the bowels*.

℞ Tinct. ferri perchloridi . . ♏xv.
Glycerini . . . . . f ʒj.
Infusi digitalis . . . . f ʒij.
Syrupi limonis . . . . f ʒij.
Infusi calumbæ . . . . ad f ℥j.

S. Ter die sumend. The addition of phosphoric acid to this prescription would prevent the formation of tannate of iron.

Cardiac tonic.

ROSEMARY, LAVENDER, AND PEPPERMINT

are agreeable carminatives, much used in combination with other stimulant drugs.

MENTHOL,

a crystalline solid, derived from the Chinese and Japanese oil of peppermint, may be used with benefit as a local application in neuralgia and other painful affections; and it has recently obtained a wide domestic popularity, under the name of 'neuralgic crystal.'

THYMOL

has been a good deal used as an antiseptic for carrying out Lister's system, but it has disappointed expectation, and has dropped out of fashion. It forms a good application in eczema, psoriasis, and ringworm.

RHUBARB.

Constitutional Action.

Physiological.

Like castor-oil, rhubarb combines some astringent properties with its undoubted cathartic effects; and, whilst the first action is no doubt due to the tannin which it contains, investigators have not yet determined on what special ingredient its purgative powers depend.

When taken in considerable doses, it not only stimulates the peristaltic movements of the small intestine, and more especially the duodenum, but it moistens and softens the fæces and increases decidedly the secretion of the bile.

Therapeutical.

The astringent action of rhubarb renders it most useful in those forms of diarrhœa depending on the presence of indigestible matters in the alimentary canal, and where removal of the exciting cause, followed by rest of the irritated intestine, is sufficient to effect a cure.

It is a good tonic in some cases of dyspepsia, and forms a good purgative for children, more especially when combined with magnesia, as in the well-known Gregory's Powder.

According to Rutherford, it is a certain, though not a powerful, hepatic stimulant. The bile secreted under its influence has the normal composition.

Prof. Rutherford's experiments on its cholagogue action would indicate its employment in jaundice and deficient secretion of bile.

The chrysophanic acid, or yellow colouring matter of rhubarb, is readily absorbed, and rapidly given out by the intestines, milk, sweat, and urine, to which latter secretion it imparts a yellow tinge, turning red on the addition of an alkali.

Dose, Mode of Administration, &c.

The smell and flavour of rhubarb are excessively nauseous, and, although we cannot effectually disguise either, we may at least render the drug moderately palatable by the following formulæ :—

℞ Infusi rhei ℥ij. ; potassii bicarb. ʒj. ; tinct. cinnamomi ʒij. ; syrupi simplicis ʒvj. ʒj. secundâ quâque horâ. In the diarrhœa of children.

℞ Pulveris rhei gr. xxx. ; sodii bicarbonatis gr. xv. ; spiritûs myristicæ ♏xxx. ; syrupi zingiberis ʒj. ; aquæ menthæ piperitæ ad ℥jss. Misce, fiat haustus nocte sumendus. Antacid and purgative.

MYRISTICA (NUTMEG).

Nutmeg is rarely used in medicine save as a flavouring ingredient.

CINNAMON.

Cinnamon is principally used for flavouring purposes, but also seems to have slightly astringent properties, which make it useful in diarrhœa. The preparations being the oil, compound powder, tincture, water, and spirit.

CAMPHOR.

Physiological.

Camphor has some rubefacient properties, reddening and irritating the skin.

Therapeutical.

Camphor forms an ingredient of most of the liniments in common use.

Internal Action.

1. *Brain and Nervous System.*—Camphor in large doses causes a good deal of giddiness and confusion of ideas, even amounting in some cases to delirium.

Muscular weakness is at first observed, but this rapidly gives way to violent epileptiform convulsions and almost maniacal excitement. In frogs, well-marked lowering of the reflex irritability of the spinal cord has been observed.

2. *Circulation.*—In small doses camphor seems to stimulate the heart's action, but after the administration of larger quantities great cardiac prostration has been observed by Dr. Geo. Johnson and others.

1. Camphor is not used, on account of its action on the nervous system, and the results of the few experimenters who have been bold enough to try the effects of large doses on themselves have not been of a very encouraging nature. The bromide of camphor is a good remedy in nervous palpitation, and in irritation of the urinary and generative organs, and has a decidedly lowering influence on the temperature.

2. Camphor has been found of service in the early stages of coryza, but must be here used with caution, as the homœopathic tincture, which is generally prescribed, is now known to be a very strong preparation, and Dr. Geo. Johnson and others have described cases in which excessive weakness and faintness, with great cardiac and muscular prostration, followed doses of from 15 to 20 minims.

3. *Respiration and Temperature.*—No influence on the respiration is noted, but there is a marked lowering of temperature.

4. *Digestive and Secreting Organs.*—In large doses some irritation of the gastro-intestinal mucous membrane has been observed, with diaphoresis, and the sexual appetite seems to be diminished.

4. Camphor is said to be a good remedy in summer diarrhœa.

It is a popular antidote to chordee.

SASSAFRAS.

This plant seems only to have acquired any therapeutic importance by reason of its combination with other drugs in the decoctum sarsæ co.

NECTANDRÆ CORTEX.

The bebeeru bark possesses some of the physiological properties of quinine. Thus it arrests the movements of the white blood-corpuscles, and checks the development of bacteria; but, unfortunately, it does not in any way fulfil the same therapeutical indications as an antiperiodic save in virtue of its bitterness acting as a tonic. Dose of the sulphate 1 to 10 grains.

SERPENTARY.

This drug is probably a gentle tonic, but the other virtues with which it has been credited seem to rest on no very stable foundation.

MEZEREON.

This drug is never used save as a constituent of the decoctum sarsæ co.

CASCARILLA.

Cascarilla is a light and agreeable tonic.

OLEUM CROTONIS (CROTON OIL).

Local Action.

Physiological.

The topical application of croton oil to the skin causes a good deal of irritation, followed by the appearance of a copious crop of papules, gradually developing into pustules. Dr. Tilbury Fox has described a symmetrical erythema on the face following this local employment; and it is said that the addition of an alkali favours the development of the counter-irritant properties of the drug.

Its use in ringworm produces an artificial imitation of a variety of the disease called kerion, in which the patches become raised, swollen, red, and infiltrated (Alder Smith).

Therapeutical.

The local application of liniments containing croton oil was in former years a favourite mode of using counter-irritation in various chronic lung affections, and it is still employed, more especially in public practice. But its drawbacks are, that it has a tendency to overact on tender or irritable skins, and the pustules are liable to leave cicatrices, so that it is difficult to believe it in any way superior to other and milder application. Croton oil is an excellent application in ringworm, with the following precautions:—

Be careful of its use in children under 6 or 7 years of age.

Do not apply it at one time to a surface larger than

a florin, and only to chronic cases, as it produces a good deal of inflammation, leaving an irritable and boggy condition of parts, which must be removed by poulticing. Repeat the painting next day, three or four applications being usually found sufficient.

Internal Action.

Physiological.

When taken internally, croton oil produces much irritation of the intestines, running on, if the dose be sufficiently large, into a very fair imitation of the symptoms of cholera poisoning, with vomiting, extreme purging, collapse, and acute inflammation of the intestines.

It is a hepatic stimulant, of very feeble power (Rutherford).

Therapeutical.

Croton oil, then, is a drastic purgative, valuable in certain cases on account of its rapid and powerful action. Thus, in apoplexy and other cerebral affections, where it is of importance to obtain an immediate and thorough evacuation of the bowels, and in some conditions of obstinate constipation, we find considerable advantage from its cautious use.

Mode of Administration, &c.

Croton oil has an acrid and irritating flavour, and is best given in the form of pill. Garrod, however, tells us that it may well be prescribed in combination with castor oil, and in case the patient is unable to swallow it may be placed on the back of the tongue.

In an extreme case we might expect to obtain some purgative effect from rubbing it into the skin, as it appears to act by absorption through this channel.

℞ Olei crotonis ♏ij. ; micæ panis quantum sufficit ut fiat pilula statim sumenda, et horis duabus repetenda si opus sit.

Or we may endeavour to keep its irritating properties in check by prescribing it in the following combination :—

℞ Ol. crotonis ♏iij. ; ext. colocynth. comp. ℈j. ; ext. belladonnæ gr. iij. Misce, divide in pil. vj., quarum sumat unam si opus sit.

For external use a very good liniment is contained in the British Pharmacopœia. In ringworm, paint on the oil, and not the liniment, which is apt to run beyond the spot to which it is applied.

RICINI OLEUM.

External Uses.

Castor oil is a substance of such bland and unstimulating quality that, were its smell less offensive, it might form a valuable external agent in certain cases. It is, however, occasionally used as a soothing application to the eye when extreme temporary irritation has been set up by the abrasion of the corneal epithelium. Castor oil will purge when rubbed into the skin.

Internal Use.

Physiological.

Castor oil gently stimulates the peristaltic movements of the intestinal canal, and slightly augments the fluid secretions of the gut. Some amount of astringent action generally follows the purgative action of the drug. Castor oil stimulates the intestinal glands, but not the liver (Rutherford).

The seeds are very irritating, and cause gastro-intes-

Therapeutical.

Castor oil is a mild and efficient cathartic, emptying the intestines without causing griping or discomfort. It is therefore useful in all cases where we simply wish to unload the bowels ; but it is not a good habitual purgative, from the subsequent constipation produced. This astringent action, however, gives it a special advantage in the treatment of diarrhœa,

tinal irritation, three having proved fatal to an adult.

many cases of which depend on the presence of irritating matter in the intestinal canal; and under such circumstances common sense naturally indicates the propriety of expelling the exciting cause. Dr. Geo. Johnson, however, goes further than this, and advocates the 'eliminative' treatment of all diarrhœas, as well as cholera.

Dose and Mode of Administration.

Although the best castor oil has but little actual flavour, it leaves a greasy, sickly impression on the palate, which is exceedingly unpleasant. It is therefore important to give it some form of combination, and we find floating the dose in a glass of cinnamon water between two strata of whisky or brandy to be an effectual plan, or we may make use of the following formulæ :—

℞ Ol. ricini ℥ss.; mucilaginis acaciæ, syrupi simplicis, āā ʒij.; aquæ cinnamomi ad ℥ij. Fiat haustus statim sumendus.

℞ Ol. ricini ʒiij.; tinct. opii ♏x.; syrupi zingiberis ℥j.; aquæ menth. pip. ad ℥ij. Fiat haustus statim sumendus. A good prescription for the diarrhœa of irritation.

KAMALA.

Physiological.

Kamala is a vermicide, killing the tape-worm rapidly and effectually, and it also possesses purgative properties.

Therapeutical.

Kamala is an efficient anthelmintic, differing from other remedies of the class in its cathartic action.

PIPER NIGRUM.

Pepper is an acrid stimulant, acting more especially on the mucous membranes, and hence, as a condiment, it is supposed to excite the secretion of the gastric juice. In former years it also acquired some reputation as a remedy for hæmorrhoids.

CUBEBS.

Physiological Action.

Cubebs also has a stimulating action on mucous membranes, and more particularly on that of the bladder and urethra. In large doses it causes considerable gastro-intestinal irritation.

Therapeutical Action.

Cubebs is occasionally used in cystitis, but it has long been known as one of the most efficient and generally prescribed remedies for gonorrhœa, acting best during the acute stage of the disease.

If has also been found useful when given in the form of lozenges for the relief of relaxed sore throat.

Dose of the pulv. 30 to 120 grains; tinct. ʒss. ad ʒij.; oleum ɱv. ad ɱxx.; oleo-resin ɱv. ad ɱxxx.

MATICÆ FOLIA.

Matico is only used externally as a local application for the arrest of hæmorrhage; and it is generally believed that it acts mechanically by the roughly reticulated under-surface of the leaf entangling the blood and forming clots. No success has attended its internal administration.

OAK BARK.

Oak bark contains tannic and gallic acids, and is therefore of some value as a topical astringent in relaxed throat, leucorrhœa, &c.

TANNIC ACID, GALLIC ACID.

External Action.

Physiological.

Tannic acid has a powerful local astringent action, owing partly, no doubt, to its power of coagulating albumen, and 'tanning' in some degree any part to which it may be applied.

Therapeutical.

Tannic acid is a better topical astringent than gallic, and may be used to arrest hæmorrhage or diarrhœa, or as an injection for gonorrhœa and leucorrhœa. Combined with glycerine, in the form of the glycerine of tannin, it is very useful as an application in various forms of sore throat, and to arrest the discharge in some chronic affections of the os uteri, in the chronic weeping stage of eczema, in ozæna, and chronic otorrhœa. It may also soothe and restrain some of those irritable coughs which depend on chronic irritation about the pharynx. Galls are used in the form of ointment, as an application to hæmorrhoids.

Internal Action.

Tannic and gallic acids are both powerful astringents, but as tannic acid is rapidly converted in the system into gallic acid, it is preferable to use the latter. This conversion is proved by the fact that, if we take the urine of a patient to whom tannic acid has been given, we find that it will not precipitate gelatine, but that it strikes a blackish tint with the per-salts of iron.

Tannic acid is rarely used internally, but gallic acid is serviceable in various forms of hæmorrhage, such as hæmoptysis, hæmatemesis, and menorrhagia; but in all of these it must yield the palm to ergot, and it is more especially in hæmorrhage from the kidney, bladder, and prostate that its curative action comes into play. It has also been used with success to check the excretion of albumen in chronic renal disease.

℞ Acidi gallici ʒj.; glycerini ℥ss.; aquæ destillatæ ℥vj. ℥j. ter die, or better every three hours, as the acid is very rapidly eliminated unchanged by the urine.

CANNABIS INDICA.

Local Action.

Indian hemp is never used locally.

Internal Action.

Physiological.

1. *On Brain and Nervous System.*—Indian hemp, like opium, possesses a double exciting and sedative action, the brain being stimulated into

Therapeutical.

1. Indian hemp may be used as a narcotic when other remedies fail; but its action is so uncertain and irregular, and the difficulty of procuring

pleasant exhilaration before sleep sets in. This preliminary effect, however, is more powerful and lasting than in the case of opium, and the subsequent condition of slumber is usually disturbed by dreams and spectral illusions. Various authors have given graphic descriptions of the intellectual disturbance produced by this drug, dwelling more especially on a peculiar feeling of double consciousness, leading on, in some cases, to partial catalepsy.

We also find indications of some special affection of the sensory nerves, a marked degree of numbness and tingling ushering in cutaneous anæsthesia and diminution of the muscular sense.

2. *Circulation.* — Some increased rapidity of pulse has been observed during the action of Indian hemp; but it is probable that this is only due to the condition of nervous excitement which we have just described.

3. *Digestive System.*—No special effect seems to be produced on the stomach or intestinal canal, and the reliable preparations so great, that our present knowledge does not enable us to lay down any practical rules for its employment. Dr. Clouston, however, has obtained valuable assistance in acute mania by prescribing the tincture in combination with bromide of potassium. Although later experience has not confirmed the pretensions of those who formerly vaunted Indian hemp as a cure for hydrophobia, chorea, tetanus, and allied nervous ailments, we may sometimes produce good results in neuralgia and migraine by its cautious use.

absence of constipation following its use gives Indian hemp one advantage over opium.

Dose and Mode of Administration.

℞ Tincturæ cannabis indicæ ʒj.; mucilaginis acaciæ ℥j.; syrupi zingiberis ℥ss.; aquæ menthæ piperitæ ad ℥vj. Misce, fiat mistura. Capiat unciam unam quartâ quâque horâ. In neuralgia, &c. The ext. is a good preparation; dose, gr. ¼ to gr. j.

TURPENTINE.

Local Action.

Physiological.

Turpentine, when applied to the skin, causes redness, tingling, and irritation, leading on to acute inflammation and blistering, if not removed within a limited period.

Therapeutical.

This effect of turpentine causes it to be much used as a counter-irritant in those cases where we wish to relieve congestion of internal organs by driving the blood to the surface. Thus, in peritonitis, pneumonia, bronchitis, and asthma, it is frequently employed, either sprinkled on hot flannel, or in the form of the linimentum terebinthinæ of the Pharmacopœia.

Constitutional Action.

Physiological.

1. *On the Brain.*—Turpentine produces, in large doses, giddiness and other symptoms somewhat resembling alcoholic intoxication, and even

Therapeutical.

ending in coma in rare instances.

2. *Circulation.*—Turpentine acts at first as a stimulant to the heart, and has undoubted astringent properties, partly, no doubt, from its coagulating influence on the albumen of the tissues, but also by causing contraction of the smaller vessels.

3. *Digestive and Secreting Organs.*—Turpentine is distinctly irritating to the alimentary canal, frequently causing vomiting and diarrhœa, and it has the property of checking mucous secretions from the various canals.

It is also a very certain diuretic of the stimulating class, but it must be used with caution, as it is apt to cause frequent and painful micturition with bloody urine, and eventual suppression of the secretion and acute inflammation of the kidneys. It is therefore well to insist on anyone using it internally to drink freely of barley water or other diluent fluids, and not to take a dose within three hours of going to bed.

2. As an astringent, turpentine is valuable in various forms of hæmorrhage, but more especially in that from the kidney and in purpura hæmorrhagica.

3. Turpentine is a valuable astringent in some forms of diarrhœa, and more especially that which results from the later and ulcerative stage of enteric fever. It is highly recommended in the same disease by some authorities when abdominal pain and distension coincide with a raw, clean, dry tongue, and in ordinary tympanites it makes a good addition to a purgative enema. It has been recommended by Dr. King Chambers as an enema in sciatica, where it is supposed to act locally on the affected nerve, which, at one part of its course, lies directly in contact with the large intestine; and it has long enjoyed a well-deserved reputation as an anthelmintic in cases of tape-worm.

Turpentine has also been given in small doses to check the excessive secretion in some forms of bronchitis, and it may also be of service in chronic cystitis, gleet, and pyelitis.

It has also been used with alleged success, though it is difficult to see on what principle, in iritis, and Dr. Crocker praises it highly in psoriasis.

℞ Olei terebinth. ♏x.; mucilaginis ʒj. Ter die sumend. post cibum. In psoriasis.

Mode of Elimination.

Turpentine is rapidly absorbed into the blood, and as quickly passes out, principally by the lungs and kidneys, imparting to the urine a peculiar violet colour.

Dose and Mode of Administration.

℞ Olei terebinthinæ ʒj.; mucilaginis ʒv.; misturæ amygdalæ, aquæ laurocerasi, āā ʒss. ʒj. quartis horis. A few drops may be given on a lump of sugar, in hæmorrhage. It may also be very conveniently given in perles and capsules.

As an anthelmintic, half an ounce must be prescribed.

FICUS.

Figs are slightly laxative.

MORI SUCCUS.

It is only used as a flavouring ingredient.

LUPULUS.

Hops are tonic and probably narcotic, more especially in the form of the old-fashioned hop pillow. Internally they are rarely prescribed, but the B. P. contains an extract, infusion and tincture; and lately lupulinum, or the powder from the dried strobiles, has been added to the list. Dose, 2 to 5 grains.

TINCTURE OF LARCH BARK.

Larch bark is said to be a useful astringent in bronchitis with copious expectoration.

PIX BURGUNDICA.

Pitch is used externally in the form of plaster.

PIX LIQUIDA (TAR).

External Action.

Physiological.

Tar acts as a stimulant to the skin, and is apt to produce an irritable papular eruption. It is rapidly absorbed, and if allowed to remain too long in contact with the surface of the body, or if applied over an extensive cutaneous area, feverish symptoms ensue, with an abundant discharge of blackish urine, smelling strongly of tar.

Therapeutical.

Tar is an excellent application in cases of chronic scaly skin disease, as psoriasis.

To lessen the risk of exciting an undue amount of irritation, it is well to wash the skin perfectly clean before renewing the application, and it is important to rub in the ointment thoroughly until it nearly disappears.

Internal Action.

Tar seems to have a stimulating action on mucous membranes when taken internally.

The vapour of tar used to be a remedy of some reputation in chronic bronchitis, and recently Prof. Ringer has recommended two-grain pills three times a day as a most efficient remedy in winter cough. The internal use of tar has also been praised by Dr. McCall Anderson in chronic skin diseases.

℞. Picis mineralis ʒij.; sp. rectificati ʒiij.; cola et adde liq. am. fort. ɱvj.; glycerini ʒvj.; aq. destill. ʒxij. A good application in chronic eczema (Anderson).

VAPOR OLEI PINI SYLVESTRIS,

a recent addition to the B. P., is used in chronic lung disorders.

JUNIPERI OLEUM.

Physiological Action.

Juniper stimulates the action of the kidneys, but, like many other remedies of its class, only increases the flow of urine where dropsy exists. It has been shown that in a healthy man the quantity of the urine is actually diminished, whilst the urea is increased.

Therapeutical Action.

Juniper is a good diuretic, generally used in combination with other drugs, and acting either when swallowed, or inhaled in the form of vapour.

℞ Spiritûs juniperi ℥ss. ; potassii acetatis ʒjss. ; spiritûs ætheris nitrosi ℥j. ; decocti scoparii ℥viij. ℥j. ter die. Diuretic mixture.

SAVIN TOPS AND OIL.

Savin used to be applied in the form of ointment to blistered surfaces, with the view of encouraging suppuration, but this barbarous process is now happily abandoned.

Internal Use.

Physiological.

Savin is a gastro-intestinal irritant, causing in large doses vomiting and purging; and it has also a powerful stimulating influence on the uterus.

Therapeutical.

Savin is sometimes used with criminal intent to procure abortion, and death has occasionally resulted from its irritant action. It is rarely used in medicine, although some authorities express faith in its emmenagogue powers.

GINGER.

Ginger is an agreeable stimulant and carminative.

CURCUMA.

Turmeric is not used in medicine. It forms the colouring ingredient in curries, and the theory has recently been broached that the yellowish tint so often observed on the skin of Anglo-Indians results from the absorption of the pigment of this substance.

CARDAMOMUM.

This is an agreeable stimulant and flavouring adjunct.

CROCUS (SAFFRON).

Saffron is never used save as a colouring agent.

SARSÆ RADIX.

Internal Action.

Physiological.

Sarsaparilla has been credited with diaphoretic, diuretic, and other powers; but none of these have stood the test of rigid investigation, and it is difficult to find any convenient heading under which to class this popular drug, unless we shelve the difficulty by calling it an 'alterative.'

Experiment has shown that this expensive and fashionable drug is quite devoid of all physiological properties.

Therapeutical.

Nor is it easier to give any decided opinion regarding its therapeutical merits; for whilst some surgeons, like the late Mr. Syme. hold it to be quite useless, others believe it to be of service in constitutional syphilis, chronic skin disease, &c. One point of difficulty in arriving at any decided conclusion is, that it is usually prescribed along with three other drugs in the compound decoction; but the late Mr. Gascoyne used to say that he had found great benefit in the treatment of the tertiary forms of syphilis by giving full doses of the freshly made infusion.

SQUILL.

Physiological Action.

In large doses, squill may act as an emetic, and cause violent vomiting with purging.

Therapeutical Action.

Squill is never used as an emetic.

It is, however, a good

It also stimulates the bronchial mucous membrane, and increases the urinary secretion.

expectorant, increasing the bronchial secretions, and is one of the most universal additions to prescriptions for the relief of various chronic lung affections, as bronchitis, and also in whooping-cough.

It is also a tolerably efficient diuretic, only to be used, however, when no irritation exists about the kidneys.

Dose, &c.

Acetum ♏x. to ♏xl. Oxymel and syrup ʒss. to ʒj. Tincture ♏x. to ♏xx. Pil. scillæ co. and pil. scillæ c. ipecac. 5 to 10 grs.

ALOES.

Physiological Action.

Aloes acts on the lower part of the large intestine, stimulating its peristaltic movements, and causing the evacuation of formed and only slightly softened fæces. It also increases the secretion of bile, being in large doses a very powerful stimulant of the liver. It renders the bile more watery, but at the same time increases the secretion of biliary matter by the liver, and some authorities hold that its purgative action is merely secondary to this. A

Therapeutical Action.

Aloes is a very certain, efficient, and mild purgative, acting, however, rather slowly, and seldom producing its effect before from six to twelve hours.

It occasionally, however, gripes, and is therefore usually given in combination with other remedies which diminish this tendency, and, from its action on the lower bowel, it must be avoided in any local inflammatory condition, or in the acuter forms of hæmorrhoids. Oppolzer

good deal of congestion about the rectum is produced, and a sympathetically stimulating effect may extend to the uterus, and tend to excite its functions, whilst chronic piles even may be benefited by its stimulating influence.

recommended aloes in piles, as below.

Its mild and slow action has caused it to be much used in dyspepsia; it forms a principal constituent of most dinner pills; and it is also a popular remedy in habitual constipation. It has also emmenagogue properties, depending partly, no doubt, on the sympathy of contiguity; and in the form of pill or decoction, and given, as laid down by Graves, at the time when the catamenia are naturally expected, it often proves most efficient.

Dose, &c.

The most useful preparations of aloes are, the compound decoction, dose ʒj. to ʒij.; the pil. aloes et myrrhæ; and aloes and iron, dose 5 to 15 grains.

℞ Ferri sulph. ℈j.; ext. aloes aquosi ʒj.; ext. taraxaci q. s. Divide in pil. lx. One morning and evening (Oppolzer).

The active principle, aloin, which is now official, acts speedily and effectually, without griping, in dose of ½ to 2 grains.

RHAMNUS PURSHIANUS, OR CASCARA SAGRADA,

is an American remedy for habitual constipation, and seems to be of service in the form of

Extractum cascaræ sagradæ; dose, 2 to 8 grains.

Liquidum; dose, ½ to 2 drachms.

RHAMNUS FRANGULA

is also a purgative, with much the same action as the preceding.

Extractum rhamni frangulæ, 15 to 60 grains.

Extractum rhamni frangulæ liquidum, 1 to 4 drachms.

VERATRUM ALBUM.

White hellebore possesses some of the physiological properties of veratrum viride, but much of its energy is expended on the alimentary canal, and violent vomiting and purging often follow its use. It is therefore now quite discarded from medical practice. When applied to the nostrils, it causes intense sneezing.

Two alkaloids have been discovered in the root-stalk, one of which has been called jervine, and the other veratralbine.

VERATRUM VIRIDE.

Some local action has been observed of an irritant nature, somewhat resembling that of veratrine.

Constitutional Action.

Physiological.

I. *Brain and Nervous System.*—1. Green hellebore has no action on the brain.

2. *Spinal Cord.*—A very decidedly depressing effect is exerted on the spine, indicated by extreme muscular prostration.

Therapeutical.

II. *Heart and Circulation.* — Veratrum viride is also a powerful vascular depressant, the pulse rate being lowered, and the arterial tension diminished; these effects being due both to a direct action of the drug on the heart-muscle, and to stimulation of the cardiac inhibitory nerves.

II. Veratrum viride has been extensively used in America on account of its depressing influence on the circulation, and it is stated that we may get good results by prescribing it in the early stages of pneumonia and other acute inflammatory conditions. Little or no English experience, however, has yet been brought to bear on the discussion of this question.

III. No effect is produced on the respiration, but a distinct lowering of temperature has been observed.

IV. *Digestive and Secreting Organs.*—Veratrum viride has emetic properties, and frequently causes vomiting; and purging also not unfrequently follows its use.

IV. It only acts as an antiphlogistic when physiological symptoms are decidedly developed.

Two alkaloids exist in veratrum viride, jervine and veratroidine, the main difference between which seems to be, that the latter is apparently responsible for the digestive disturbance which occasionally results.

Dose.

The tincture is most generally used in practice. Dose, 5 to 20 minims.

SABADILLA, VERATRINE (THE ALKALOID OF CEVADILLA).

External Actions.

Physiological.

The application of veratrine to the skin causes first pricking and tingling, followed by redness and acute darting pain. To this succeeds numbness, due, in all probability, to some local anæsthetic influence on the extremities of the sensory nerves.

The slightest contact of veratrine with the nasal mucous membrane causes violent irritation and prolonged sneezing.

Therapeutical.

Veratrine has been used with success as a local application in cases of neuralgia of the fifth nerve, but its irritating properties must always be a barrier to its extensive employment.

Internal Actions.

Physiological.

I. *Brain and Nervous System.*—1. No action on the brain.

2. *Spinal Cord.*—A good deal of elaborate, but unfortunately contradictory, experimental evidence has been adduced by various observers with reference to the effects of veratrine on voluntary movement. In the first place,

Therapeutical.

convulsions and even tetanic spasms may be produced by the administration of the drug, but these are speedily followed by paralysis and complete muscular prostration; and the balance of testimony goes to show that this is due to a primary exciting and secondary paralysing action on the muscular structures themselves.

II. *Heart and Circulation.*—Veratrine first increases the action of the heart by stimulating its motor ganglia, but secondary slowing and depression rapidly ensue from an exciting action on the vagi. It is probably directly poisonous to the heart-muscle itself, the action being arrested in contraction.

III. Respiration is at first quickened, but subsequently retarded by the lowering effect of the drug on the respiratory centre. The temperature of the body falls.

IV. *Digestive and Secreting Organs.*—Veratrine often causes troublesome vomiting and purging, and the saliva and sweat are increased.

II. Veratrine is never used internally in this country.

Trousseau advised its use in pneumonia and in gout and rheumatism.

STAPHISAGRIÆ SEMINA.

This is a recent addition to the B. P., and is used for the preparation of an *ointment*, which is an effectual and unirritating cure for scabies.

COLCHICI CORMUS ET SEMINA.

Internal Action.

Physiological.

The leading physiological action of colchicum is undoubtedly directed to the intestinal canal, large doses causing free vomiting and copious purging of yellowish fæces containing a large quantity of bile. The action of the heart is usually somewhat depressed. Christison, Maclagan, and others assert that the proportion of urea and uric acid, as well as the amount of urine excreted, are increased, but this is denied by Gubler.

Gubler denies all specific action, believing it to be a 'spoliative,' and only exerting its full powers when physiological effects are produced, from 3 to 4 stools a day being recommended. He believes it to be 'cumulative.'

Therapeutical.

As the experiments of Rutherford have shown that colchicum increases the biliary secretion, it may be a useful adjunct to cholagogue pills, although its own purgative action is too violent to be encouraged.

Its principal use is as a remedy for gout, more especially the acuter forms; and here it never fails to remove pain rapidly, without, however, in any way lessening the tendency to future attacks. How it acts is unknown, and we can only call it a specific. It is also very valuable in various diseases of gouty parentage, as in some forms of dyspepsia, bronchitis, &c.; but in acute rheumatism it has been proved to exert rather a noxious than a beneficial influence.

Dose and Mode of Administration.

Colchicum may be given either in one or two full doses, or in smaller quantities spread over a longer time. Of these plans the former is probably the most effectual in an acute attack of gout. Alcohol is said to be the best solvent, because all acids, even those of urine and vinegar, transform the colchicine into colchiceine, a neutral glucoside of very inferior strength. The following formulæ are suitable for various gouty conditions:—

℞ Tincturæ colchici seminis ♏xx.; potassii bicarbonatis gr. x.; aquæ pimentæ ℥j. Misce, fiat haustus ter die sumendus.

℞ Tincturæ colchici seminis ♏xv.; magnesii carbonatis gr. vj.; magnesii sulphatis gr. xxx.; aquæ menthæ piperitæ ad ℥j. Ter die sumend.

℞ Extracti colchici acetici gr. x.; pulveris digitalis, extracti colocynthidis compositi, āā ℈j. Misce, fiant pilulæ xx. Sumat unam bis terve in die.

℞ Potassii iodidi, ammonii carbonatis, āā ℈j.; vini colchici ʒj.; tincturæ scillæ, tincturæ hyoscyami, āā ʒij.; aquæ camphoræ ad ℥iij. ℥ss. ter die. Dr. Greenhow's formula for gouty bronchitis.

The active principle colchicine is from 80 to 100 times more powerful than the plant, and has been used hypodermically in chronic rheumatism and gout. Dose, gr. $\frac{1}{32}$.

FARINA TRITICI.

Flour is only of dietetic importance.

MICA PANIS.

Bread crumb is used as a vehicle for pills.

AMYLUM.

Starch is a demulcent used with advantage to some irritable conditions of skin in the form of the glycerine of starch, and also as a medium for enemata.

HORDEUM DECORTICATUM.

In the form of decoction, barley is used as a demulcent drink. Malt extract is much used, and highly appreciated under a variety of forms as a tonic and nutrient.

SACCHARUM PURIFICATUM.

Sugar is principally used in the form of syrup as a flavouring adjunct.

CETRARIA (ICELAND MOSS).

This plant is supposed to have nutritious properties.

ERGOTA.

External Action.

Ergot has no local action.

Internal Action.

Physiological.

1. *On Nervous System.*— No special action on any part of the nervous system has been proved, save some anæmia of the nerve centres caused by vascular contraction.

Therapeutical.

1. Dr. Brown-Séquard advises the use of ergot in some forms of paraplegia unattended by irritation, and where inflammatory symptoms have subsided, believing that it acts well by con-

2. *On Vascular System.*—Ergot slightly depresses the action of the heart, and reduces the number of its pulsations; and it is said that the arterial tension is at first lowered in some slight degree. This effect, however, rapidly passes away, and a decided rise in arterial tension follows the contracting influence of the drug on the arterioles. On examining the web of an ergotised frog's foot, we may distinctly observe the gradual contraction of the smaller vessels up to absolute obliteration of their calibre; and this is believed to be due to a primary action of the ergot on their muscular walls rather than to the intervention of the vaso-motor system. Thus we observe a direct contrast to the action of the nitrite of amyl.

tracting the dilated vessels. Dr. Crichton Browne has recently prescribed ergot with success in some forms of chronic mania.

2. Ergot is now allowed to be by far the best astringent in cases of internal hæmorrhage, and more especially in menorrhagia, hæmoptysis, and epistaxis the use of the liquid extract has quite superseded the older treatment by means of acids, gallic acid, and the like; whilst, if a more rapid action is required, we may subcutaneously inject ergotine.

It is also a valuable remedy in purpura. Von Langenbeck, of Berlin, has advocated the injection of ergotine for the obliteration of aneurysmal sacs, but sufficient evidence has not yet been brought forward of the success of this practice; and it has also been advised in the case of old varicose veins. The gangrenous form of ergotismus is doubtless due to arterial contraction cutting off the supplies of blood to the extremities. It has been highly praised by Da Costa in diabetes insipidus and albuminuria.

Da Costa considers ergotine the most effectual remedy for the night sweating of phthisis. Dose, gr. ij.

3. *Respiration and Temperature.*—No special action.

4. *Urinary Functions.*—Ergot, from its specific action on unstriped muscular fibre, tends to contract the bladder, and, by raising the tension in the Malpighian bodies of the kidney, it increases the urinary flow.

4. Ergot has been used successfully, and more especially when combined with iron, in that most troublesome affection, incontinence of urine; but, in my own experience, belladonna is more deserving of confidence. Ergot has been recommended as a diuretic, and Langenbeck has much faith in subcutaneous injections of ergotine for the relief of the atomy of the bladder and enlarged prostate met with in the old.

5. *Digestive Organs.*—Ergot occasionally causes sickness, vomiting, and diarrhœa; but constipation is more likely to follow its use, from its contracting influence on the intestinal capillaries.

5. Ergot has been successfully prescribed in cases of diarrhœa and dysentery.

6. *Uterine Functions.*—Ergot has a remarkable and almost selective influence on the uterus, contracting its muscular walls, promoting its functions, and encouraging the expulsion of its contents.

6. Ergot acts as an ecbolic, expelling the contents of the uterus by causing contraction of its muscular walls. It must only be used, however, where no disproportion exists between the child and the maternal passages, and where

we are prepared to render instrumental aid at once, if necessary, when the pains have been aroused. We must also remember that its prolonged use is apt to endanger the life of the child by cutting off its supplies of blood through the placenta.

Ergot is also of service in flooding, in reducing the size of hypertrophied or subinvoluted wombs, and in promoting the destruction of submucous polypi, either by cutting off their supply of blood, or by squeezing them out of the uterine cavity. It is also an excellent remedy for amenorrhœa and some forms of leucorrhœa.

Mode of Elimination, Dangers, Cautions.

In those countries where ergotised rye largely prevails, two forms of disease attend its use. 1. The gangrenous form of ergotismus, where extensive dry gangrene of the nose, face, and extremities supervenes; and 2. The spasmodic variety, where the victim is afflicted with most violent and agonising spasms. The therapeutic use of ergot, however, is of course never productive of such symptoms, and the only inconvenience occasionally observed is some digestive derangement, with colicky abdominal pain. Three preparations are official:—

Extractum ergotæ liquidum. Dose, ɱx. ad ʒj.
Infusum ergotæ. Dose, ℥j. ad ℥ij.
Tinctura ergotæ. Dose, ɱx. ad ʒj.

The powder is also used in doses of from 20 to 30 grains, and many experienced authorities recommend a fresh infusion made with the powder and swallowed.

Ergotinum may be employed by subcutaneous injection in doses of 3 to 10 minims of the injectio ergotini hypodermica of the B.P., but this process has the drawback of causing a painful black and unsightly lump at the seat of puncture. Sclerotic acid, however, which is the most active principle derived from ergot, may be conveniently used hypodermically. Dose, gr. $\frac{1}{2}$ to gr. $\frac{3}{4}$.

℞ Ergotini ʒij.; chloral hydratis ʒss.; aquæ destillatæ ʒvj. Inject 16 drops into the gluteal muscle. A formula for subcutaneous injection recommended by Prof. Simpson.

℞ Extracti ergotæ liquidi ʒij.; decocti aloes compositi ad ℥viij. Misce, fiat mistura, de quâ capiat unciam unam bis in die. Useful in amenorrhœa.

℞ Pulveris ergotæ ʒj.; sacchari ʒiv.; aquæ bullientis ℥iij. Misce. Capiat cochlearia duo magna quartâ quâque parte horæ ad effectum. In a case of labour.

In a case of amenorrhœa from anæmia we may add a little ergot to any chalybeate mixture.

EMMENAGOGUES AND ECBOLICS.

Of these we may consider, first,

Ecbolics.

Physiological Action.

Ecbolics are substances which cause such violent contraction of the pregnant uterus as to effect the expulsion of its contents. It is not quite certain whether the principal members of the group act

Therapeutical Action.

Ecbolics are used extensively in obstetric practice, when it becomes necessary to stimulate the flagging powers of an exhausted uterus, the principal being ergot, digitalis, savin, borax, quinine. We

specially on the muscular structures of the organ, or whether a primary intervention of nervous influence through the spinal cord is necessary.

are also compelled, under certain circumstances, to have recourse to the induction of premature labour, as when dangerous sickness goes on unchecked, or when weakened abdominal or thoracic viscera are injuriously compressed by the pregnant uterus. In such cases, however, it is generally found best to use mechanical means.

Emmenagogues

may be direct or indirect.

Physiological Action.

Direct emmenagogues act merely by restoring the normal functions of the uterus when these are suspended.

Indirect emmenagogues act by removing some constitutional condition which interferes with the due performance of the uterine functions. Thus amenorrhœa very frequently depends on anæmia, or constipation may require removal before our more special remedies will act, or there may be constriction of the os, or atomy of the uterus, or the spine may be at fault.

Therapeutical Action.

Most of the ecbolic drugs act as emmenagogues when given in small doses to a non-pregnant patient, and to the list we may add rue and castor. Of all these, however, ergot is by far the most effectual.

Strychnine, electricity, the different preparations of iron in combination with aloetic or other purgatives act well, and we may aid our chances of success by all hygienic means, as well as by warm hip-baths, leeches placed preferably on the internal condyles of the femurs, and mustard stupes, at the normal menstrual periods.

FILIX MAS.

Local Action.

Fern oil has no local action.

Constitutional Action.

Physiological.

The only marked action of the male fern is that of killing tape-worms. It occasionally produces a little nausea and diarrhœa, but in most cases it can be taken without discomfort.

Therapeutical.

Fern oil is used in medicine purely as an anthelmintic. Its destructive influence over all varieties of tænia has been effectually proved by a great mass of evidence, and one or two doses generally succeed in dislodging the entire worm. It is essential that the draught should be taken on an empty stomach, and, the intestines having been first cleared by a purgative, we direct our patient to fast for a few hours before bed-time, when he is advised to take a drachm of the liquid extract, suspended in milk. Or we may avail ourselves of the following formula, which acts well in concealing the nauseous flavour of the drug :—

℞ Extracti filicis liquidi fl. ʒjss. ; mucilaginis tragacanthæ fl. ℥ss. ; syrupi zingiberis fl. ʒij. ; aquæ ad fl. ℥jss. Misce, fiat haustus nocte vel primo mane sumendus.

ANTHELMINTICS.

The human body being infested with various parasites whose presence is inconvenient and even dangerous, it is necessary for us to be provided with means for their safe and speedy removal. Some of these unwelcome guests are, unfortunately, out of the range of medicine, but others are so placed that they can readily be destroyed; and we shall arrange them in classes, according to the special drugs which act specially upon them.

Physiological.	*Therapeutical.*
1. Tape-worms, as the tænia solium, derived from eating measly pork; the tænia medio-canellata, from veal or beef; and the tænia lata, from salmon. These occupy the small intestines, and give rise to various ill-defined but uncomfortable sensations.	1. The best remedy for the tæniæ is now allowed to be male fern oil given on an empty stomach; but if this should possibly fail, we may have recourse to kousso, turpentine, pomegranate root, or areca nut. We must remember that, although these remedies kill the worms, they do not necessarily expel them from the intestines, and that a purgative may be required for the purpose; and it is also essential to find the head of the tape-worm before we can assure our patient that he is freed from his tormentor.
2. The round worm, or ascaris lumbricoides, inhabiting the small intestine, and occasioning a long array of nervous symptoms, more especially in children. They are	2. Santonin acts as a true specific in at once destroying these troublesome parasites.

supposed to be introduced into the system by impure water.

3. The thread-worm, or oxyuris vermicularis, found in the cæcum or colon, and causing much itching and irritation. They are almost universal among the children of the poor, but opinions differ as to whether they must be regarded as the cause or the effect of the peculiarly cachectic condition with which their presence so often coincides.

Other forms of parasitic intrusion within the various tissues are well known, but are generally incurable; and the trichina spiralis, the various forms of hydatid disease, &c., must usually be permitted to run their destructive course unchecked.

3. It would seem rather a roundabout practice to attack parasites in the lower gut by drugs administered through the mouth; and although purgatives, such as scammony, calomel, jalap, &c., are of use in these cases, our chief reliance must be placed on enemata of quassia, tincture of iron, lime water, common salt, &c.

In the general treatment of parasites, we must not trust entirely, however, to the use of anthelmintics, but must also exclude all possibility of infection by forbidding raw or underdone meat or fish, and by insuring general cleanliness and an efficient water-supply. In addition to this, we must remedy the unhealthy condition of mucous membrane, which favours their development, by giving alkaline remedies and bitter tonics in various forms of combination.

In prescribing our remedies for the expulsion of the tape-worm, it is well to insure a thorough evacuation of the intestines, so that the parasite may not be in any way shielded from the action of the drug by food or mucus. After a preliminary purge, we direct our patient to fast for a few hours, and then administer the fern oil and milk, either at bedtime or in early morning.

MUSK.

Musk is stimulant and antispasmodic, and was formerly much valued in France, and by Graves, of Dublin, in typhus, pneumonia, and other diseases tending to assume an adynamic type ; but it has now also fallen into comparative disuse.

MILK

is only used in the B. P. in the preparation of the mistura scammonii, but much might be written on its importance as a dietetic and therapeutic agent. In many cases of acute illness when solid food is inadmissible, milk forms our great resource, the only drawback being the tendency which it possesses of coagulating in the stomach and intestine into solid masses, which cause irritation. This may be prevented by peptonising it by pancreatic extract, and hiding the bitter flavour thus developed by the addition of coffee, or by slowing the action of the ferment by adding it to cold or iced milk. (Address in Therapeutics, Roberts, 1855, British Medical Association.)

SUET, SUGAR OF MILK

have no special therapeutical properties.

FEL BOVINUM PURIFICATUM.

Physiological.

Bile is well known to act as a laxative, to aid the digestion of the fatty and amylaceous constituents of our diet, and to prevent the decompo-

Therapeutical.

It has therefore been supposed that when a deficiency of bile is supected, we may hope to derive advantage from ox-gall administered in gela-

sition of food within the intestines, with consequent flatus and digestive disturbance.

tine capsules, so that its action may be deferred until it reaches the small intestines. In some forms of dyspepsia and in chronic diarrhœa it is said to be a useful remedy, but little clinical evidence on this point can be adduced.

PEPSIN.

Physiological.

Pepsin is the most important digestive element of the gastric juice, and more especially reduces the albuminoid and proteinaceous constituents of food to a fit state for absorption. Probably, as suggested by Gubler, pepsin acts, partly at least, by directly stimulating the secreting function of the gastric mucous membrane.

The ordinary pepsin wines rapidly become inert, because the alcohol does not prevent the ferment from change, glycerine being the most effective means of preservation.

The acid glycerine is undoubtedly the best fluid preparation.

Therapeutical.

There can be little doubt that many dyspeptic conditions are due to a deficiency of gastric juice, and attempts may be made to supply this by prescribing pepsin, preferably in combination with dilute hydrochloric acid.

In atonic dyspepsia, in various anæmic and cachectic conditions, in the diarrhœa of children, in some forms of spasmodic asthma, its use seems to be attended with good results; but we may well share Dr. Wood's scepticism as to the possibility of materially aiding the digestion of food by the small doses usually prescribed.

Pepsin has also been recommended as an addition to nutritious enemata, so as to insure some preliminary diges-

tion of the injected food; and the peptonised milk, gruel, and beef-tea recommended by Roberts, of Manchester, and usually prescribed in combination with liquor pancreaticus, are very useful, given either by mouth or rectum.

Dose.—2 to 5 grains; of the acid glycerine ʒj. to ʒij.

ADEPS, CETACEUM

require no special notice.

ALBUMEN.

White of egg is of use as an antidote to various corrosive poisons, as perchloride of mercury, and the yolk (vitellus) has nutritive properties.

ISINGLASS, HONEY, CERA ALBA ET FLAVA, COCCUS.

These do not require special comment.

CANTHARIS.

External Action.

Physiological.

The first effect of the application of cantharides to the skin is tingling and smarting, speedily followed by vivid redness and severe burning pain. To this succeeds the formation of large blebs containing

Therapeutical.

Blisters are used to fulfil the following indications:—

1. To relieve pain. There can be no doubt that blisters frequently check pain most effectually, as in subacute pleurisy, pleurodynia, gastral-

a watery fluid rich in albumen and fibrine; and if the blister be allowed to remain for any lengthened period in contact with the skin, ulceration and sloughing may supervene. It has been found that the moderate counter-irritant action of cantharides causes the copious exudation of white blood-corpuscles into the subcutaneous areolar tissue, with engorgement of the more superficial structures underlying the skin, whilst the deeper strata look pale, anæmic, and flabby, the lungs even being affected in this way. It has also been shown that the irritant action of cantharides may penetrate through the skin, and cause redness and inflammation of the pleura and peritoneum. The first constitutional effect of a blister is a slight elevation and subsequent depression of the temperature, with weakening of the action of the heart.

It not uncommonly happens that cantharides may be absorbed through the skin, and cause kidney irritation, indicated by difficult and painful micturition, and the passage of blood.

gia, sciatica, and neuralgia, it being important that in this last-named affection the counter-irritant should be placed as near as possible to the root of the affected nerve.

2. To check inflammatory conditions. There is no doubt that some local inflammations may be checked by blistering a neighbouring vascular area. Thus, in iritis and some other inflammatory affections of the eye, benefit may be procured in this way; and in acute rheumatism blisters applied immediately above the inflamed joints rapidly remove pain and swelling.

On this principle, also, Mr. F. Jordan recommends his iodine treatment of localised surgical affections already referred to.

In how far inflammations of internal organs may thus be treated with advantage is a somewhat open question; for although the withdrawal of blood from the deeper structures might theoretically be considered beneficial, it is practically found that the pain and annoyance of blisters add to the feverish discomfort of the victims of acute disorders.

3. To promote absorption. Blisters are supposed to aid the absorption of effused products, fluid or solid, and are therefore much used in thoracic dropsy, either pleural or pericardial, the later stages of pneumonia, chronic joint-disease, &c.

4. To stimulate and alter vascular or nervous functions, &c. Blisters may be employed to rouse patients from the stupor of typhus, or narcotic poisoning, or various brain affections, to check obstinate vomiting, and under various other conditions laid down in works on practical medicine.

Internal Action.

Physiological.

Cantharides is a gastro-intestinal irritant, and also a renal irritant and diuretic, causing an increased flow of urine, but frequently giving rise to a good deal of strangury with painful, frequent, and difficult micturition, and bloody urine. This irritation may spread by sympathy to other allied organs, and uterine excitement on the one side, or excess of venereal appetite with chordee and

Therapeutical.

Cantharides is not much used internally on account of its irritating properties. It is, however, occasionally prescribed in pyelitis and some chronic affections of the kidney, and in chronic diseases of the spine.

Some authorities also have praised it highly in psoriasis. It has also been used for the purpose of procuring abortion, and it possesses emmenagogue properties.

seminal emissions on the other, may follow the administration of large doses.

Dose of tincture, 5 to 20 minims.

Cautions, Mode of Administration.

We must use blisters with caution under the following circumstances :—

In the aged, infirm, or very young, where troublesome ulceration is apt to ensue.

In acute inflammatory conditions, and more especially those of the kidney.

To cicatricial tissue, or to parts deprived of some of their vitality by the withdrawal of nervous influence, as in paraplegia.

Blisters are usually kept on from ten to twenty hours, but we may well limit the period to six or eight hours, and develop the blebs by a subsequent poultice. When the desired effect has been produced, let out the watery fluid, and apply a thick layer of cotton-wool.

COUNTER-IRRITATION.

The theory of the action of epispastics and rubefacients has given rise to much interesting physiological speculation, but we are not yet able to lay down, with absolute precision, the laws on which the beneficial action of these remedial agents depends. We know this much, however, that blisters may occasionally act locally on deeper-seated parts, as we are told that redness and inflammation of pleura and peritoneum may be produced by the vesicating influence of cantharides applied to the cutaneous surface superficial to these structures.

Then, again, vascular connection may explain other phenomena, and more especially may this be traced in the chest between the pericardial vessels and those of the skin immediately over the heart, and in the lumbar region between the

superficial vascular supply and that which furnishes to the kidneys their due allowance of arterial blood.

These more direct and obvious explanations of various interesting therapeutical phenomena do not, however, lead us very far, and we are compelled to fall back upon much more abstruse considerations. Into these neither our space nor the scope of the present volume will permit us to enter very far, and we only very briefly draw a slight outline of those branches of the question which seem to have reached something of vigorous growth.

Now, for the relief of pain, counter-irritation may act, 1st, by removing or modifying the structural condition on which reflected suffering depends, as we often cure a facial neuralgia by extracting a carious tooth ; or, 2ndly, the end organs of the sensory nerves may be modified in molecular arrangement ; or, 3rdly, the trunks of the nerves themselves, or the nuclei of the nervous centres, may be altered in some unexplained way by the stimulus applied to the seat of pain.

For other purposes, also, counter-irritation may act by altering or redistributing blood supply, as by actually emptying the deeper vessels and filling the more superficial arterioles at their expense ; or special function or nutrition may be pro foundly affected by influencing the trophic or other nerves which more especially preside over these departments of physiology.

The practical applications of counter-irritation in the treatment of disease are both numerous and interesting ; but when considering iodine, mustard, and cantharides, we have already devoted some space to the consideration of the principles which should guide us to their successful use.

OLEUM MORRHUÆ.

Local Action.

Cod-liver oil is not used in virtue of any local action, as its nauseous smell effectually prevents it from forming the basis

of ointments or liniments. Being very readily absorbed by the skin, however, it is occasionally introduced into the system by inunction when the patient is unable to take it by the mouth, and I have seen most excellent results produced in strumous, rickety, and syphilitic infants in this way.

Constitutional Action.

Physiological.	*Therapeutical.*
1. *Brain and Nervous System.* — Cod-liver oil can only be said to act on the nervous system by improving its nutrition and supplying the fatty ingredients necessary for growth and repair.	1. It is therefore specially indicated in all nervous affections dependent on debility, such as neuralgia, some forms of insanity, asthma, whooping-cough, &c.
2. *Circulation.*—It has a tonic influence on the circulating organs, by improving the quality of the blood and strengthening the heart-muscle. It has been shown that it causes an increase in the red corpuscles of the blood.	2. It is therefore much used in simple debility, in convalescence from acute illness, in anæmia, and other weakened conditions of the system.
3. *Respiration and Temperature.*—No special physiological influence is exerted on either of these functions.	3. Under this heading we may place, for convenience, the wonderfully restorative effects of cod-liver oil in chronic lung disease, but more especially in the various forms of pulmonary phthisis. It is beneficial in asthma and chronic bronchitis, but in consumption it really seems to be directly curative. It may be given with advantage

4. *Digestive and Secreting Organs.*—It has been proved by experiment that animal are much more digestible than vegetable oils, and cod-liver oil is the most readily assimilated of all. After being emulsified by the pancreatic juice, it comes in contact with the bile, which distinctly increases its power of passing through moist animal membranes; and it is probable also that the biliary principles, incorporated in its own structure, aid in enabling it to be easily absorbed by the lacteals. Its action on the system now is to improve the general constitutional tone, to evolve force and heat, and to aid in supplying those fatty elements which are so essentially requisite for the construction and repair of the tissues.

It supplies the fatty matter on which the proper function of cell growth and development depends, the nuclei of in all stages, and under its use patients often rapidly gain flesh, and not only manage to hold the disease at bay, but even occasionally seem to escape from its clutches.

4. Cod-liver oil is most invaluable in diseases depending on defective nutrition, as in all scrofulous conditions, such as strumous ophthalmia, caries of bones, chronic joint affections, glandular enlargements, &c.; also in rickets and all the wasting disorders of childhood, in senile atrophy and decay, in chronic rheumatism, in all the ulcerative varieties of skin disease, and in advanced constitutional syphilis. Various attempts have been made to explain the actions of the oil by means of certain special ingredients which it contains; but none of these have been very successful, and we cannot at present do more than attribute its restorative influence to its ready digestibility and nutritive properties, acting as it does as a hydrocarbon in nourishing the body. Possibly, however, some therapeutic value may be ascribed to

the cells being formed of fat. (Gubler.)

Cod-liver oil occasionally causes nausea, vomiting, and diarrhœa, and it has been shown to increase in some measure the biliary secretion. minute quantities of iodine, bromide, and phosphoric acid in its substance.

Mode of Elimination.

The greater part of the oil is absorbed into the system, but a little is given off by the fæces; and it is well to watch the evacuations of children under its influence, to see whether any undigested oil escapes, thus indicating an overdose.

Drawbacks, Mode of Administration.

Cod-liver oil occasionally produces so much nausea, eructation, and discomfort, as to compel us to suspend its administration; but most patients, and more especially children, speedily grow accustomed to its use. An eruption of acne occasionally breaks out, caused by the passage of the acrid constituents of the oil through the cutaneous glands. It is advisable to prescribe it in small doses, an hour or two after meals or at bedtime, to give it with some light tonic, and so suspend its use from time to time, more especially in hot weather or when bilious symptoms supervene. It may well be given in combination with a little alcohol, beaten up with the froth of porter, with mucilage or lemon juice, floating on the top of a tablespoonful of water in which a pinch of ordinary table salt has been dissolved, or with from ♏x. to ʒj. of æther purus, which, Dr. B. Foster tells us, aids digestion by stimulating the pancreatic secretion; and if the pale oil is used, very few persons will be found entirely rebellious to its use. Children, as a rule, take it well, but if they prove obstinate we may give it with orange wine, or in the following combination:—

℞ Olei morrhuæ fl. ℥ss.; mucilaginis acaciæ ℥ij.; sacchari albi ʒij.; tincturæ lavandulæ comp. ♏xx.; aquæ fl. ℥ss. ʒj. pro dosi.

An agreeable oil cream and jelly has been made, or we may use it in biscuits or chocolate.

Black coffee forms a good medium for adults, or we may give the oil floating on the following mixture:—

℞ Acidi nitrici diluti ♏x.; acidi hydrocyanici ♏iij.; tincturæ aurantii co. ʒss.; aquæ ℥ss.

Dose.

This should never exceed half an ounce.

LEECHES.

Leeches are undoubtedly the most convenient means for the local abstraction of blood, and are used to relieve pain, which they do very effectually in certain local inflammations, as pleurisy, pericarditis, orchitis, iritis, hepatitis, peritonitis; and there is reason to believe that when applied sufficiently early they may even moderate the inflammatory process. Their action, no doubt, may frequently be explained by direct vascular communication between superficial vessels and those of deeper parts.

Each leech may contain about 1½ drachm of blood, and subsequent fomentation may draw as much more from the skin as to raise the total amount up to half an ounce. Should the subsequent bleeding prove difficult of arrest, as sometimes happens, we may succeed in staunching the flow by means of pressure, cold, various astringents, the application of solid nitrate of silver, or the twisted suture.

Special cautions in the use of leeches are—never to apply them, if possible, to any part over which firm pressure cannot subsequently be made, as the larynx; not to apply them in the evening, when, for some unexplained reason, the bleeding is

more apt to be troublesome; and of course never allow their use in any victim of the hæmorrhagic diathesis.

If leeches will not bite, we must smear the skin with cream or freshly drawn blood, or immerse the animal itself in porter, which seems to have a stimulating effect; and should one be unfortunately swallowed, we can kill it and cause its expulsion from the stomach by common salt.

ANTIDOTES.

Physiological.

The first thing to be done in any case of poisoning is to empty the stomach, and to eliminate the poisonous substance from the tissues.

The next stage in our proceedings must be to obviate the tendency to death, accord-

Therapeutical.

This may be effected in the first place by emetics, and more especially those of the direct class; but it will often happen, particularly in narcotic poisoning, that emetics will not act, and that we are forced to have recourse to the stomach-pump. Caution in the use of this instrument, however, is requisite in cases of irritant poisoning in which the mucous membrane of the stomach is softened or partially destroyed. When evacuation of the stomach has been completed, we may employ gentle purgatives and diuretics, in addition to such remedies as iodide of potassium, which favour the elimination of metallic substances.

Thus, if cardiac syncope be the main symptom, we must give stimulants; if the

ing to the various vital processes attacked by the poison.

Having got so far, we must then proceed to use our antidotes proper, which may be divided into (1) chemical, which directly neutralise the action of the poison by destroying its properties; and (2) physiological, which have distinctly antagonistic properties, being indeed, in many cases, absolute counter-poisons.

respiratory centre seems in danger of becoming paralysed, we must excite respiratory action by cold affusion, irritation of the skin, and the employment of artificial respiration, and give atropine, which stimulates the origin of the pneumogastric nerve in the medulla; if narcosis prevail, we must endeavour to rouse the brain; and if irritation of any particular organ arises, we must soothe it by appropriate remedies.

1. Among the first class we may rank alkalies in acid poisoning, animal charcoal as rendering the vegetable alkaloids innocuous, and liquor potassæ as depriving belladonna and its congeners of all physiological power.

2. The second contains all those various substances which have been described here and there in these pages as directly antagonistic to one another, as opium within certain limits to belladonna, Calabar bean to atropine and strychnine, aconite to digitalis; and this class of antidotes has the advantage over the more purely local or chemical, that they are able to pursue

their foe into the blood, and attack it boldly and successfully there.

I have borrowed from the second American edition of my book the accompanying handy tables of the treatment of cases of poisoning.—[R.F.]

POISONS.

A poison is a substance of animal, vegetable, or mineral nature, which, when administered in small quantity, is capable of producing deleterious effects upon the human system. It may be introduced into the economy in a gaseous, liquid, or solid form, through any of the channels of absorption, though more commonly by the gastro-intestinal tract.

General Antidote for Poisoning when the Nature of Poison is unknown.

℞ Magnesiæ,
Pulv. carbo. ligni,
Ferri oxidi rubri, āā ʒj. M.
To be given freely in a sufficient quantity of water.

Or, as suggested by Jeannel :—

Calcined Magnesia . .	ʒij.
Washed animal charcoal .	ʒj.
Water	ʒxx.

To be kept well covered; when exhibited to be mixed with—

Solution of ferrous sulphate (sp. gr. 1·45) ʒijss., and well agitated.

Given in doses of ʒjss.-iij. in poisoning by arsenic, zinc, the alkaloids, &c.[1]

This preparation is harmless, but is effective, for its ingredients are antidotes to the most common and active poisons. With it may be given demulcent drinks, such as milk or flour and water, to dilute the poison and protect the stomach.

[1] *The Practitioner's Reference Book*, R. J. Dunglison, Phila., 1877, p. 228.

Prompt Treatment Table of Poisons.

Arranged alphabetically for ready reference.

Acetic Acid.—The alkaline carbonates, chalk, or magnesia. Vomiting should be encouraged, and demulcent drinks freely given.

Aconite.—Active emetics, or stomach-pump. Stimulation externally and internally. Digitalis is a physiological antidote; also finely powdered animal charcoal, or tannin, and astringent infusions.

Alcohol.—Stomach-pump; cold affusion; inhalation of vapour or hypodermic injection of ammonia; use of electricity, &c.

Alum, and Sulphate of Alumina and Potassa.—Warm dilute drinks to produce emesis; hydrate of magnesia, or weak solution of carbonate of ammonia; stomach-pump.

Ammonia.—Vegetable acids, as dilute vinegar or lemon-juice; olive oil; milk given copiously; stomach-pump should not be used.

Amylene.—Same treatment as for chloroform poisoning.

Antimony and its Salts.—Tannin, as in tincture or infusion of cinchona, infusion of green tea, or of galls. Free vomiting with warm mucilaginous drinks, or stomach-pump. Opium and internal and external stimulation may be employed subsequently.

Arsenious Acid.—Hydrated sesquioxide of iron to be given in a moist state in tablespoonful doses, followed by castor oil. (The hydrate may be extemporaneously prepared by adding aqua ammoniæ to dilute tinctura ferri chloridi.) Solution of dialysed iron and freshly precipitated hydrate of magnesia have also been employed. These are not reliable if the arsenic has been taken in form of powder. In the absence of vomiting, prompt emesis by sulphate of zinc or warm mustard and water. Warm demulcent drinks.

Barium, Salts of.—Sodium or magnesium sulphate; emetics and stomach-pump.

Belladonna.—No reliable chemical antidote; tannin and animal charcoal have been employed. Physiological antidote, morphia, which may be administered subcutaneously. Usual treatment for narcotic poisons.

Bismuth Subnitrate.—Albumen, milk, sugar, mucilaginous drinks.

Brucia.—Same treatment as for poisoning by nux vomica.

Calabar Bean.—Physiological antidote, atropia, cautiously administered hypodermically.

Camphor.—Emetics, stimulants, wine, and opium.

Cantharides.—Free emesis to be encouraged with warm demulcent drinks; castor oil; demulcent injections.

Carbolic Acid.—Saturated solution of saccharate of lime has been re-

commended as an antidote. Early use of the stomach-pump. Olive oil, flour and water, &c.

Carbonic Acid Gas.—Artificial respiration, friction, stimulants, fresh air, and electricity.

Chloral.—Stomach-pump; stomach well washed out with tea or coffee. Diffusible stimulants. General treatment same as for opium poisoning, or poisoning by chloroform vapour.

Chloroform.—In poisoning by liquid chloroform, use the stomach-pump and emetics. If collapse occur during anæthesia, reverse the patient as recommended by Gross. Ammonia by inhalation, ice in rectum, hypodermic injections of brandy and ammonia, &c.

Chromium, Compounds of.—Magnesium carbonate or chalk, in milk, albumen, or water, followed by emetics.

Citric Acid.—Alkaline carbonates, chalk, or magnesia.

Cocculus Indicus.—Mucilaginous drinks, stimulants, and emetics.

Colchicum.—Prompt emesis, castor oil, demulcents, opium, and stimulants.

Conium.—Mustard and warm water. Active stimulation, externally and internally.

Copper, Preparations of.—Antidote, white of eggs, freely administered, or milk. Vomiting should be aided by warm mucilaginous drinks; stomach-pump if necessary.

Corrosive Sublimate.—Albumen, mixed with water and given copiously, forms insoluble compound; white of one egg neutralises four grains of corrosive sublimate. Gluten, or wheat-flour paste, or milk, also employed. Free vomiting aided by warm diluent drinks; stomach-pump to be used with caution—may produce perforation.

Creasote.—Emetics or stomach-pump; demulcent and mucilaginous drinks.

Croton Oil.—Same general treatment as for other irritant poisons, to counteract excessive vomiting and purging. Opium, stimulants, demulcents.

Curare.—Same general treatment as that mentioned for poisoning by narcotics; artificial respiration, hot coffee, &c.

Cyanide of Potassium.—See Potassium.

Digitalis.—Vegetable infusions containing tannic acid render the active principle insoluble. Give emetics and hot applications to surface.

Ether, Vapour of.—Cold affusion; exposure to current of air; artificial respiration.

Gold, Preparations of.—Sulphate of iron; mucilaginous drinks.

Hydrochloric Acid.—See Muriatic Acid.

Hydrocyanic Acid.—Mixture of protosulphate and sequisulphide of iron (ferrous and ferric sulphate), followed by solution of potassium car-

bonate. Being rapidly fatal, treatment must be instantaneous. Cold affusion; cautious inhalation of ammonia and chlorine vapours; stimulation externally and internally.

Hyoscyamus.—Same general treatment as for poisoning by belladonna and vegetable narcotics.

Iodine.—Starch or flour, in water.

Iron, Chloride and Sulphate.—Magnesia, copious diluent drinks.

Lead Salts.—Zinc sulphate, producing free emesis, and forming insoluble lead sulphate. Milk and white of egg, given copiously, form insoluble compounds. Solutions of magnesium or sodium sulphate, freely administered, act as antidotes and cathartics; castor oil may also be administered.

Lobelia.—Emetics, purgatives, stimulants.

Methylene, Bichloride of.—Same treatment as for poisoning by chloroform vapour.

Morphia.—See Opium.

Muriatic or Hydrochloric Acid.—Solution of alkaline carbonates in water or milk; magnesia or chalk suspended in milk; soapsuds; scrapings from whitewashed walls (in the absence of other articles); free use of barley water, oily emulsions, gruel and milk in large quantities.

Nitrate of Potassium.—See Potassium.

Nitric Acid and Nitromuriatic Acid.—Same treatment as already detailed for poisoning by muriatic acid. Dilute solution of sodium carbonate, or fluid magnesia, with water, and milk or demulcents may be given.

Nitrous Oxide.—Same general treatment as for poisoning by chloroform vapour.

Nux Vomica.—See Strychnia.

Oil of Bitter Almonds.—Same treatment as for hydrocyanic-acid poisoning.

Opium and its Preparations.—Antidotes, tannic acid and iodated iodide of potassium. Physiological antidote, solution of atropia or tincture of belladonna. Treatment, direct emetics, as large doses of zinc sulphate, repeated if necessary, or mustard and warm water, or stomach-pump. For the narcotic effect of the drug, affusion with cold water, walking the patient, arousing him by shaking and shouting; flagellations; enemata of strong coffee. If unsuccessful, electricity and artificial respiration.

Oxalic Acid.—Avoid the use of alkalies or their carbonates, as they form poisonous salts with the oxalic acid. Give chalk or calcined magnesia, or its carbonate, suspended in water or milk, which forms insoluble and inert earthy oxalates; or saccharated solution of lime.

After treatment, mucilaginous drinks, lime-water, and oil; warmth and stimulants.

Phosphorus.—Free vomiting; albuminous and mucilaginous drinks in which hydrate of magnesia is suspended. Oil, being a solvent of phosphorus, should be avoided. Old oil of turpentine (containing oxygen), oxygenated water, oxygen inhalations, animal charcoal, have been employed as antidotes.

Physostigma.—See Calabar Bean.

Potassa.—Mild vegetable acids, as dilute vinegar or lemon juice; demulcent drinks; olive oil, in large quantities, produces a soap. Milk may be copiously administered. Stomach-pump should not be used.

Potassium Bitartrate (cream of tartar).—Same treatment as for the nitrate. Dilute solution of potassium bicarbonate reduces bitartrate to harmless neutral tartrate.

Potassium Cyanide.—Weak solution of ferrous sulphate converts it into Prussian blue; subsequent treatment similar to that for hydrocyanic acid.

Potassium Nitrate.—No direct antidote; stomach-pump; free vomiting, and copious mucilaginous drinks; stimulants, opium, and coffee, if great depression exists.

Prussic Acid.—See Hydrocyanic Acid.

Silver, the Salts of.—Albumen, milk. If nitrate, give the chloride of sodium, followed by emetics.

Soda, and its Preparations.—Same treatment as for potassa poisoning.

Stramonium.—Same treatment as for poisoning by belladonna. Morphia should be administered hypodermically.

Strychnia.—Bromide of potassium, in very large doses. Hydrate of chloral, nitrite of amyl, and atropia have also been recommended. Prompt emesis by stomach-pump, or mustard and warm water, or mixture of ipecacuanha and zinc sulphate. Inhalation of chloroform, continuously employed, may relieve tetanic rigidity.

Sulphate of Indigo.—Calcined magnesia and milk, or fluid magnesia.

Sulphuric Acid.—Same treatment as for poisoning by muriatic acid. Solution of sodium carbonate in milk and water. Stomach-pump must not be used.

Tartaric Acid.—Same treatment as for poisoning by citric acid or oxalic acid.

Tartar Emetic.—See Antimony.

Tobacco.—Stomach-pump or emetics; whisky, strychnia, stimulating injections *per anum*, containing turpentine, or ammonia.

Veratrum.—Rapid emesis, stimulants, with laudanum or some other opiate. Tannin has been proposed as an antidote.

Zinc Chloride.—Albumen given liberally. Free emesis, copious warm mucilaginous drinks, or stomach-pump.

Zinc Sulphate.—Tepid water, with milk and albumen; infusions containing tannic acid. Stomach-pump. Laudanum and starch emetics.

There are a number of so-called *vegetable irritants*, such as aloes, scammony, and jalap, which may give rise to toxical symptoms. Their effects should be treated on general principles, such as the employment of emetics, diluents, castor oil, opium, and fomentations. The same remarks apply also to the various articles of diet, such as meat, fish, lobsters, or fruits which occasionally produce similar results. *Irritant gases*, as chlorine, nitrous acid, or sulphurous acid vapour, &c., may act as poisons, and their effect should be treated by removal of the patient from the causes, cold affusion, and by antidotes as directed. The numerous poisonous *fungi* which may be taken into the stomach may also produce symptoms, and require treatment on general principles.

Bites of venomous reptiles require special treatment; the wound may be sucked with impunity, provided there be no abrasion upon the lips or tongue. The limb above the point having a ligature placed around it, or compressed, the part involved may be excised or cauterised with the hot iron or nitric acid. The intravenous injection of ammonia has also been advised. Stimulants, as ammonia or brandy, should also be freely given. The local treatment here detailed would also be applicable to *bites of rabid animals*.

The following table, from Taylor 'On Poisons,' gives a comprehensive review of the most approved antidotes for the several principal poisons noticed in the foregoing pages, which should be committed to memory:—

NON-METALLIC POISONS.

	Poisons.	*Antidotes.*
Mineral Acids	Sulphuric, Nitric, Muriatic, Nitro-muriatic	Magnesia mixed with water or milk; calcium carbonate; compound chalk powder; soda; potassa; the fixed oils.

Poisons.		*Antidotes.*
Vegetable Acids and their Alkaline Salts	Oxalic, Tartaric	Calcium carbonate (chalk or whiting).
	Potassium Binoxalate	Calcium carbonate. Calcium sulphate, and water.
	Potassium Bitartrate	Sodium carbonate in solution.
Alkalies	Potassa, soda, ammonia, and their carbonates	Vinegar, lemon-juice, citric acid, or oil.

METALLIC POISONS.

Arsenic and soluble arsenites.	Hydrated peroxide of iron; hydrated magnesia; solution of dialysed iron. Mixture of oil and lime-water.
Corrosive sublimate, and salts of mercury.	Albumen, gluten, or flour, diffused in water or milk.
Baryta and its soluble salts.	Sodium, potassium, magnesium, or calcium sulphate.
Barium carbonate.	Mixture of magnesium sulphate and vinegar.
Alum.	Sodium or ammonium carbonate.
Soluble salts of lead.	The alkaline, or soluble earthy sulphates.
Lead carbonate.	Magnesium sulphate and vinegar.
Soluble salts of copper.	Albumen, gluten, flour diffused in water; milk.
Tartar emetic.	Decoctions and tinctures containing tannic acid. Magnesia.
Antimony chloride.	Sodium carbonate; magnesia.
Salts of tin.	Milk; sodium carbonate; magnesia.
Zinc sulphate, or acetic.	Milk; sodium carbonate; magnesia.
Ferrous sulphate.	Sodium or ammonium carbonate.
Silver nitrate.	Sodium chloride, and emetics.

NARCOTIC POISONS.

Opium; hyoscyamus.	Emetics; stomach-pump; cold affusion. Strong decoction of coffee; electro-magnetism; tannic acid.
Prussic acid.	Ammonia; chlorine; cold affusion; iron and potassium carbonate.

NON-OFFICIAL PREPARATIONS.

Having now completed the study of the various articles contained in the national Pharmacopœia, we shall proceed to give a brief *résumé* of the properties of the most useful among those drugs which have not yet received official sanction. Among these will be found some very important remedies, in addition to plants of great physiological interest, whose active medicinal powers have not yet been fully tested in practical medicine, and whose investigation opens up a valuable field for clinical observation.

ABSINTHIUM.

Wormwood was formerly used as a bitter tonic and anthelmintic, but it has now quite disappeared from practice. Its prolonged use as a beverage in the form of liquor has been shown to produce a condition of enfeeblement and irritability of the nervous system, with a tendency to epileptiform convulsions.

BORO-GLYCERIDE

has been recommended by Barwell as an antiseptic in surgical manipulations and dressing.

Soak lint in a solution of 1 in 20.

PARALDEHYDE

is a good hypnotic, acting quickly, safely, and well, causing no headache nor digestive disturbance, and exerting no depressing action on the heart. It is thus serviceable in cases where chloral is inadmissible. Dose, 30 to 90 grains with syrup and a bitter tincture.

DUBOISIA.

The actions of this drug strongly resemble those of atropine, as it causes throat dryness, dilatation of the pupil, cephalalgia, vertigo, and drowsiness, the pulse and respiration being quickened, and a reddish eruption sometimes appearing on the skin. It has been successfully given in the sweating of phthisis.

PICROTOXIN

is an excellent remedy for the night sweats of phthisis.

DICHLORIDE OF ETHIDENE

has lately been introduced as an anæsthetic, and has been favourably reported on by the Glasgow Committee of the British Medical Association.

It seems to be intermediate in its effects between chloroform and ether, depressing the heart and causing sickness in a less degree (and less capriciously) than the former vapour. Clover values it in minor cases, using it after the previous production of insensibility by nitrous oxide gas.

ETHYL BROMIDE

has been used as an anæsthetic, 2 drachms being sufficient to cause insensibility. It acts quickly, the effect rapidly passes off, and it does not physiologically depress the heart or breathing, but several deaths have followed its administration, and its use, therefore, has been discontinued.

ETHYLATE OF SODIUM.

This is enthusiastically praised by Richardson as an application to nævus, mother's marks, lupus, and nasal polypi. It should be painted on with a camel-hair brush, and the resulting pain, which is often severe, may be relieved by an alcoholic solution of opium.

GRINDELIA ROBUSTA

has been highly praised as a remedy for asthma, but it is difficult to obtain it pure.

Dose.

℥ij. of the fluid extract every quarter of an hour during the attack, following by smaller doses during the interval.

FUCHSINE

in dose of gr. j. in pil. diminishes the albumen in the urine, in chronic kidney disease.

INGLUVIN

is of use in the vomiting of pregnancy, and atonic dyspepsia. Dose, gr. x., t. d. immediately after meals—sprinkled on bread,

CONVALLARIA MAJALIS

has been found to be a cardiac tonic and diuretic, acting usefully in failure of compensation in mitral stenosis and regurgitation. Dose, gr. v. of the extract.

VIRGINIAN PRUNE BARK,

containing tannin and prussic acid, has been recommended in debility of digestive organs, painful affections of stomach, and as a cardiac sedative. Dose, extract of cerasin, gr. ij. to x.

EUCALYPTUS GLOBULUS.

Eucalyptus is an excellent antiseptic, proving rapidly destructive to infusoria, its principal drawback being its volatility. The unguentum eucalypti (B. P.) is a good preparation. Lister believes the oil to be a perfectly trustworthy antiseptic, and recommends its mixture with Dammar varnish, which holds it in combination and prevents too rapid evaporation previous to its addition to gauze impregnated with paraffin.

It possesses the advantage of being quite free from the toxic and locally irritant effects of carbolic acid.

It paralyses the spinal cord and medulla, a period of preliminary excitement rapidly giving way to profound muscular

weakness, loss of reflex activity, and finally death from respiratory failure.

The pulse loses in force, the temperature is lowered, and the excretion of urea is increased.

As regards the therapeutics of the drug, it is greatly inferior to quinine as an antiperiodic, but there seems to be no doubt that the presence of the plant in large numbers deprives malarious districts of much of their virulence.

It has also been recommended in bronchitis and asthma. Its combined local and internal use has been praised in catarrh of the bladder, dysmenorrhœa, and leucorrhœa, and a strong case seems to have been made out in favour of the inhalation of from 10 to 60 drops of equal parts of the oil distilled from the leaves and rectified spirit in diphtheria. Dose of the tincture, ʒss. to ʒij.

Eucalyptus (oil and ointment) is now included in the British Pharmacopœia.

NITRITE OF SODIUM.

has been recommended in cases of epilepsy and angina pectoris, and appears to have been occasionally of service. But it possesses very active physiological properties, and is apt to cause a variety of nervous symptoms, which are both uncomfortable and alarming, and which more than neutralise any advantages to be derived from its use.

GELSEMIUM.

Constitutional Action.

Physiological.

1. *Brain and Nervous System.*—Moderate doses produce redness of the conjunctiva, pain in eyelids, contraction of pupils, followed by slight ptosis, whilst large doses of gelsemium cause vertigo and double vision. A para-

Therapeutical.

1. Gelsemium has been prescribed with success in *neuralgia* of the fifth nerve, *intercostal* and *ovarian neuralgia*, and *myalgia*.

Dr. Spencer Thompson has cured 40 cases of neuralgia successfully by gelsemium,

lysing influence is exerted on the spinal cord, the power of voluntary movement being finally quite abolished, numbness and staggering being preliminary symptoms. Reflex irritability is also suspended, the pupil dilates, and at a later stage the sensory columns of the cord are also paralysed, producing complete anæsthesia (Bartholow). The first nerve affected is the sixth at its termination, causing paralysis of the external rectus, and later on the third is also attacked. A curious point about its action is, that when taken internally it contracts the pupil, whereas on topical application, rapid and full dilatation is produced, being complete in from 50 to 70 minutes. One advantage which it undoubtedly has over atropine, in addition to the swiftness of its effects, is, that the resulting diminution of accommodation for near objects is never so well marked, and passes away partially in 10 or 15, and absolutely in 30 hours.

Ringer tells us that large doses of the alkaloid gelsemine, of which $\frac{1}{6}$ grain has caused death, at first paralyse, and pointing out, however, that its beneficial action is confined to affections of the trifacial nerve, and more especially to the branches supplying the upper and lower jaw, and particularly the latter, and that the dose must be ɱxx. of the tincture, repeated, if necessary, in $1\frac{1}{2}$ hour. My own observation quite confirms this, and relief is obtained even when the neuralgia starts from the irritation of a carious tooth.

This would indicate a certain advantage in ophthalmoscopic examinations over atropine, which causes much annoyance to hard-worked people by impairing vision for a week or ten days after use.

It has been recommended as a remedy for *tetanus*.

then excite tetanus, which in a short time gives way to paralysis.

2. *Heart and Circulation.* —A slightly weakening effect on the heart is noted. It diminishes the pulse-rate by lessening the irritability of the excito-motor ganglia of the heart, and the arterial pressure by diminishing cardiac irritability and vaso-motor tonus.

3. *Respiration and Temperature.* — The respirations become laboured, shallow, and irregular, from diaphragmatic paralysis, death ensuing from asphyxia. The temperature falls, probably in consequence of the profuse perspiration which it induces.

3. Bartholow recommends gelsemium in various forms of convulsive or *spasmodic cough*, and in acute inflammations of the lungs and pleura he thinks it may do good by diminishing the activity of the respiratory functions.

Dose, &c.

We may give the *tincture* every three hours, until drooping of the eyelid and muscular languor are noted. But, remembering that some persons are peculiarly susceptible to its physiological action, we must begin our dose cautiously from 2 to 3 minims, gradually increased up to 20 or 30. The dose of the alcoholic extract is $\frac{1}{2}$ to 2 grains.

Gelsemium is now included in the British Pharmacopœia.

SANGUINARIA OR BLOOD-ROOT, AND ITS ALKALOID SANGUINARINE.

This is a substance of energetic physiological properties, causing clonic convulsions of spinal origin, diminishing reflex

action, weakening the force of the heart, and lessening arterial tension, lowering the temperature, dilating the pupil, and finally causing death by respiratory paralysis. It also possesses emetic properties, and stimulates the hepatic secretion. It has been used more especially in America, and has been found useful in atonic dyspepsia and duodenal jaundice, in chronic catarrh, and some stages of bronchitis, and may be given in doses of 5 to 10 minims of the tincture three times a day.

JEQUIRITY

in fresh infusion has been a good deal used of late as an application to granular lids. It often causes, however, a good deal of irritation, which may become unmanageable and destructive; and we would counsel caution in its employment.

SALICINUM.

Salicin acts as a bitter tonic, and has some antiseptic and antiperiodic qualities, which have caused it to be used, with only partial success, in the treatment of malarial affections. Recently, however, it has been most extensively employed as a remedy for acute rheumatism, on the recommendation of Dr. Maclagan, who holds it to be safer than salicylic acid, as not tending to depress the heart, the dose being from 10 to 50 grains every two, three, or four hours; and if we wish to get the full antipyretic effect of the remedy we must prescribe it boldly in 2 or 3 doses of 30 to 50 grains repeated at hourly intervals. He also praises it highly in periodic neuralgia and coryza.

Salicin is now included in the British Pharmacopœia.

ANTIPYRIN

has undoubted antipyretic properties, and has proved useful in the fever of phthisis in doses of 15 grains twice a day. We must prescribe it, however, with a certain amount of caution, as serious and even fatal collapse has followed its use, and as vomiting and a measly eruption are occasional sequelæ.

TEA, COFFEE, GUARANA, COCOA.

These substances, containing the same alkaloid, caffeine, have much the same effects.

Caffeine is a very active substance, causing at first increase, but later diminution, of the reflex functions of the cord, with nervous convulsions and muscular rigidity, the motor nerves not being affected. The heart's action is first accelerated, but afterwards retarded. The excretion of urea is lessened. The frequent and prolonged use of tea and coffee causes, in some persons, a variety of nervous sensations, sleeplessness, numbness, and tingling of the extremities, with irritability of the heart; and there is no doubt that much loss of appetite and flatulent dyspepsia originate in the habit of drinking tea shortly before or after meals. The invigorating and restorative effects of tea and coffee are well known, and valued by persons undergoing much bodily fatigue. The therapeutic indications for tea and coffee are almost restricted to the administration of the latter substances in cases of opium poisoning.

Guarana in 20-grain doses has been found a useful remedy for migraine or sick headache.

TEREBENE

is a good antiseptic and germicide.

TRIMETHYLAMINE AND ITS HYDROCHLORATE.

Lowering of temperature and pulse is said to follow the use of this drug, and it has been recommended as a remedy for acute rheumatism.

Dose of the hydrochlorate, 3 to 10 grains.

CASCA BARK.

The Bark of Erythrophlæum guineense, generally called Casca, Cassa, or Sassy Bark.[1]

This is the ordeal bark of Angola. If the victim vomits he is acquitted, if it causes purging he is put to death. In an examination into its physiological action by T. Lauder Brunton, M.D., F.R.S., and Walter Pye, Esq., fifty-four experiments were tried on various animals, and it was found to uniformly cause vomiting, purging, weakness, and finally death during a convulsion.

The purgation is probably due to a local action, as it never follows subcutaneous injection. The intestinal secretion is not increased; respiration is accelerated from stimulation of pulmonary branches of vagus, and not from action on respiratory centre. On circulation a primary slowing is caused from stimulation of the vagi, as it ceases after section of these nerves; and secondarily quickening, by paralysis of the ends of the vagus in the heart, thus resembling the action of digitalis. The arterioles contract (either directly or) from nervous action, the blood-pressure rises, and the secretion of urine is increased. Brunton believes that it will be found even a more effectual drug than digitalis.

Powdered casca is a sternutatory.

GAULTHERIA,

or winter green, is an excellent remedy in acute rheumatism, and is said to possess the virtues of salicylic acid without its drawbacks, being prompt, efficient, and agreeable, and under its use relapses are less common. It is also of service in chronic cases, and as a topical application. Large and frequent doses must be given—mx. in an emulsion with glycerine and water.

[1] See *Phil. Trans. Royal Soc.*, vol. cvii. part 2, rev. ed., 1870.

CURARE—WOORARA.

LOCAL EFFECTS.

Physiological.

Curare is an irritant to denuded surfaces, causing pain and inflammation.

Therapeutical.

It is only applied to wounds for its constitutional influence.

Constitutional Effects.

1. *Nervous System.*—The mind remains clear. The inferior extremities are first and chiefly affected. 'It seems probable, however, that the primary operation of woorara is upon the terminations of the nerves, and not on their central origin' (Stillé).

2. *Muscular System.*—When injected into the blood, or hypodermically, curare causes general muscular paralysis, first affecting the inferior extremities, but ultimately involving all the muscles, including those of respiration. A large dose causes death by paralysis of respiration and asphyxia, but the heart continues beating after the breathing ceases, and animals may be restored by artificial respiration.

It is apt to cause ptosis in

1. In epilepsy and chorea, curare has been tried and found to be useless.

2. This agent has been employed in almost all forms of muscular spasm, but it is in tetanus that it has achieved its best results. It is certain that it reduces the muscular contractions and saves the patient from the consequent exhaustion. It is reported to have cured 13 out of 33 cases of tetanus, and deserves further trial.

In hydrophobia it also exerts a good effect by relieving the violence of the convulsions and reducing their frequency.

man, and mydriasis and diplopia may occur.

3. *Upon Secretion.*—When taken by the mouth, curare is eliminated by the secretions nearly as rapidly as absorbed, so that it is almost innocuous in this way, simply acting as a diuretic and diaphoretic.

In three cases it has been thought to have cured patients afflicted with rabies canina.

3. As it is believed that if any abrasion or ulcer exist in the stomach the drug may exhibit its toxic effects, its internal use is not considered advisable in any considerable dose.

Administration, Dose, &c.

Curare is best exhibited hypodermically, in order to insure exactness of administration. A solution in distilled water (one part in one hundred) is the most available form, but it should be freshly prepared. Ten minims of this solution would be the ordinary dose, to be carefully repeated until its characteristic effects on the muscular system are observed.

What has been termed the sulphate of curarine has been used in doses of one-tenth that of the extract.

Hamamelis is an astringent, useful in hæmorrhage, either locally applied or internally administered.

Dose: tincture, ♏ij.–v.; fluid extract, ♏x. to ʒij.

Vaseline is a soothing and agreeable application in skin diseases.

Kaposi strongly recommends in eczema an ointment made by dissolving and thoroughly incorporating by heat equal parts of lead plaster and vaseline, adding a little oil of bergamot.

Osmic Acid seems to have some locally soothing effect in cases of neuralgia and sciatica, from 3 to 5 minims of a 1 per cent. aqueous solution being injected deeply into the neighbourhood of the affected nerve.

Euonymin is a powerful hepatic, but a feeble intestinal stimulant (Rutherford).

Dose, gr. ss. to gr. v.

IRIDIN is a powerful hepatic stimulant, and also stimulates the intestine, but not so powerfully as podophyllin.

Dose, gr. j. to gr. v.

LEPTANDRIN is a hepatic stimulant of moderate power. It is a feeble intestinal stimulant.

Dose, gr. ij. to gr. iv.

SANGUINARIN is a powerful hepatic, but feeble intestinal stimulant.

MUSCARIN causes perspiration, flushing, giddiness, and salivation, but in a less degree than jaborandi, and acts more on the bowels.

It slows the heart and causes dyspnœa from contraction of the pulmonary vessels. When given by the stomach it contracts, but when topically applied widely dilates, the pupil. It is at present, however, only a physiological curiosity, and is never used in medicine, its principal interest being the very exact antagonism to atropine which it possesses.

QUESTIONS.

In submitting a series of questions to the consideration of the student, I have endeavoured to place various suggestive points before him in interrogative form, and to approach the border line between practical medicine and therapeutics by introducing a few short illustrative cases. The principle seems to me worthy of further development, and a systematic collection of typical diseases, with variations and exceptions and bed-side gleanings, might lead the way profitably up to those diffuse collections of symptoms which are occasionally rolled into concrete form by our examining boards.

It would not be difficult to expand my collection of queries to an almost unlimited extent; but the conscientious attempt to answer those already constructed will at all events encourage the young reader to think for himself, and to emancipate his mind and memory from the enervating trammels of the more grinding forms of manuals.

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1. A child is under treatment for whooping-cough, and the mother states that after each dose of his medicine his face flushes and he complains of his throat being very dry. What drug is most likely to produce these symptoms?

2. Mention the different remedies to be employed in the various stages of syphilis.

3. A case of acute eczema presents itself for treatment; there is much moist exudation, with smarting and tingling and almost erysipelatous redness. It is proposed to give arsenic. Would this meet with your approval, and what would be your line of practice?

4. A patient comes to you in great alarm, thinking that he is paralysed, his legs feeling weak and heavy, and his gait becoming staggering. At the same time you observe a few

pimples of acne on his forehead, and you learn that he has lately been suffering from sleeplessness. To what would your suspicions point as the cause of his symptoms?

5. Give directions for disinfecting a room which has been occupied by scarlatinous patients.

6. Mention a drug which seems to have a specific influence over the poison of erysipelas, and write a prescription, with full directions for its use.

7. Write a prescription for an effervescing draught containing carbonate of ammonium.

8. Point out the error in the following prescription:—

℞ Tinct. hyoscyami ʒss.; liq. potassæ ♏xx.; mucilaginis ʒj.; gentianæ infusi ℥j. Ter die.

9. You are called to a very severe case of delirium tremens. It seems unadvisable to give opium, and chloral has already failed. What course, therefore, would you pursue?

10. Mention the antidotes for prussic acid, strychnine, arsenic, and opium, with the general line of treatment to be pursued in a case of poisoning by each of these substances.

11. You are called to the following case. A middle-aged man has been known to suffer from heart disease, and on applying your ear to his chest you hear a well-marked mitral regurgitant bruit. His face is pale, with a tendency to lividity, his feet are beginning to swell, his pulse is weak and irregular, and does not accurately correspond to the beat of the heart, many of whose pulsations are not transmitted to the wrist. There are great anxiety and breathlessness, and ordinary stimulants have given only temporary relief. State your line of practice in such a case, and more especially the drug from which you would expect to derive speedy benefit.

12. Mention the various drugs which have been of service in tetanus, with your opinion of their relative efficiency, and give the dose of each.

13. Explain the action of the principal anæsthetic agents, and state what you consider to be most worthy of confidence.

14. Mention the remedies which act on the pupil, and

divide them into those which act locally and constitutionally. Are there any drugs which act differently on the pupil when taken internally and locally applied ?

15. What is the disadvantage of the following prescription ?—

℞ Tincturæ opii ♏x. ; acidi sulphurici diluti ♏xx. ; decocti hæmatoxyli ʒj. Ter die sumend.

16. Write a soothing cough medicine for a case of phthisis, and include chlorate of potassium and morphine. Dose, one teaspoonful.

17. State the general treatment of a case of chorea, with the principal drugs which have been found useful, and give your opinion of their respective merits.

18. What are the indications by which we know that conium, arsenic, and strychnine are beginning to produce their physiological effects ?

19. Mention those drugs which are most readily absorbed through the unbroken cuticle.

20. Enumerate the principal cholagogue cathartics.

21. State the principal differences between the action of opium and morphine.

22. You are called to see a case of severe sprained ankle, and hear that a friend is about to apply tincture of arnica. On inquiry you find that this remedy has never been used to this patient before. Would you sanction the treatment ?

23. Enumerate those drugs which stimulate, and those which depress, the action of the heart.

24. State which drugs are most worthy of confidence in cases of neuralgia of the fifth nerve.

25. A patient presents himself with the following symptoms :—Constipation and violent colicky pain in the belly, some loss of power in the extensor muscles of the arms, a bluish line along the margin of the gums, anæmia. What is the cause of, and the proper treatment for, his complaint ; and what prophylactic means would you recommend him to adopt ?

26. Mention the various means of lowering the bodily temperature in health and disease, and explain their action, more

especially enumerating those remedies which act only in conditions of pyrexia.

27. You have been attending a case of rheumatic fever, and all has gone on well until you are told one morning that the patient has had a disturbed night, has been restless and delirious, but that, at the same time, the pain in the joints has subsided. You find him looking dull, confused, and only partially conscious. The temperature registers 105°, and in another hour has gone up to 106°. What treatment would you advise?

28. State the principal dangers to be anticipated in chloroform administration, with their appropriate remedies.

29. Mention the unpleasant effects which sometimes follow the use of quinine.

30. What do you mean by 'accumulation' in therapeutics?

31. A young married woman comes to ask relief for troublesome sickness and vomiting, recurring at intervals throughout the day, but always worse on first rising in the morning. What would you advise in the way of treatment, and how can you explain her symptoms?

32. Write a prescription for an alkaline lotion in a case of acute eczema.

33. Mention the best narcotics to be used under the following circumstances:—

1. Sleeplessness from overwork or worry.
2. Delirium tremens.
3. The fierce delirium of typhus.
4. Acute mania.

34. Write a prescription for iron in combination with pot. iod. and a vegetable bitter.

35. Mention the various drugs which produce eruptions on the skin, and describe the forms of eruption produced.

36. Mention the drugs which impart a peculiar colour to the urine, with the varieties of tint produced.

37. Contrast the paralysing effects of conium, Calabar bean, and veratrine.

38. State the physiological phenomena which may follow comparatively small doses of quinine, pot. iod., pot. bromidum, chloral, and mercury.

39. State what you mean by a 'refrigerant.'

40. You are called to see a patient in an advanced stage of phthisis, in whom the night sweats are causing serious exhaustion. All astringent remedies having failed, what drug would you recommend to be employed, and in what doses?

41. A patient is seized with acute tonsillitis, and it is of great importance that he should recover his voice in a short time. Mention a drug which you might prescribe with good hopes of speedy benefit.

42. An elderly man is attacked with acute bronchitis, the cough and dyspnœa being urgent, and the sputa brought up with difficulty. The blood is beginning to be imperfectly aerated, the skin looking dusky and the lips blue, and although he is occasionally drowsy by day, he can obtain no sleep in the night from the constant and irritating cough. His family are much distressed at this insomnia, and having persuaded the doctor to give him something to make him sleep, a full dose of opium is ordered. State the probable result of this line of practice.

43. You are summoned to see a case of ague. The patient cannot take bark or quinine in any form. What drug would you recommend in their place?

44. A case of diarrhœa presents itself, characterised by furred tongue, cramping pains in the abdomen, sickness, and tenesmus, with the expulsion of rather scanty but thin and frequent evacuation. It is proposed to arrest this by means of astringents. State whether this treatment would meet with your approval, and what your own plan would be.

45. You are called to a bad case of hæmoptysis. All the usual astringents and styptics have failed. What drug would you recommend, and how would you administer it?

46. State the best remedies for nocturnal incontinence of urine.

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